Issued Weekly by the

Hill Publishing Company

JOHN A. HILL, Pres. and Treas. ROB'T MCKEAN, Sec'y.

505 Pearl St., New York.
6 Bouverie St., London, E. C.
Unter den Linden 71, Berlin.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

During 1910 *we printed and circulated* 526,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for August, 1911, *averaged* 9750 *copies per issue.*

September 2	10,500
September 9	9,500
September 16	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

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**Illustrated.*

The Engineering and Mining Journal

Vol. 92. SEPTEMBER 16, 1911. No. 12.

Low Cost of Mining on Mother Lode

A discussion of low mining costs inevitably leads to comparison with the Homestake in South Dakota and the Alaska-Treadwell and its neighbors on Douglas island, the mines usually cited as the two remarkable examples of the profitable working of low-grade ore and low costs of mining. At both these mines an enormous quantity of ore is treated daily, and, as those mines are perhaps the best known gold producers of North America, there has been a natural tendency to associate low working costs and profits from low-grade ore with an enormous crushing capacity. Yet there are many mines throughout the United States, Canada, Mexico and Central America, where the total costs of production are materially lower than at the Alaska-Treadwell, and as low-grade ore is profitably worked. At none of these mines is a large tonnage of ore crushed; that is, as compared with the Homestake or Alaska-Treadwell.

In this issue of the JOURNAL, William G. Devereux gives an account of mining and milling operations at the Melones mine on the Mother Lode of California. The gold from the Mother Lode mines is produced from ore of an average value of $5 per ton. At the Melones mine about one-third of the gold is recovered by amalgamation, and two-thirds by concentration, a reversal of the usual conditions of that region.

Mr. Devereux states the many favorable conditions making low working costs possible. Of the figures he gives in the table of costs, the total charge to mining account and the cost of power are most significant. These are the two items that vary widely at different mines. At the Melones mine no ore or water has to be raised; they are taken from the mines through an adit. It is the cost of pumping water and hoisting ore that so largely affects the cost of mining at many mines; these are operations in which the cost of power is a large factor. Also in stoping, the cost of which at Melones is but 30c. per ton, the breaking of the ground is usually the greatest item of expense, and in ground breaking the cost of power exceeds all other items except labor. There is abundant water power available for all the requirements of the opertions at the Melones mine. This power is remarkably cheap, and perhaps the most significant fact shown in Mr. Devereux's article is the influence of cheap and abundant power on the costs of mining.

It is interesting to note that in stoping, large piston drills have been found preferable to small piston, or air-hammer drills. This is in accord with the experience at the majority of mines working a large vein; the small drills have been found more satisfactory in narrow veins, but large piston drills generally find favor in wide orebodies.

A Proposed Method of Timbering

In this issue of the JOURNAL is reprinted an article on a proposed modification of square-set timbering, read at a meeting of the Australian Institute of Mining Engineers by A. J. Moore. The idea advocated by Mr. Moore of using triangular instead of rectangular panels is not new; several attempts have been made to adopt a truss system of timbering to support the walls of a mine. At one mine in the Southwest trusses of long span are occasionally used, but except for variation in the jointing, the square set, where now used, is practically the same as finally adopted by Deidesheimer, on the Comstock lode, 40 or 50 years ago.

For many years there was a mania for using Deidesheimer's system and miners from Virginia City were in great demand. They introduced the square set in many mines where none of the conditions requiring such timber existed, a fact amply proved by the number of great stopes that were once filled with square sets, now decayed and fallen, yet the stopes remain open.

The square set has been widely adopted and still serves a useful purpose in many mines wherein no other method of keep the stopes open would be satisfactory. However, other methods have been developed. Shrinkage stoping, filling with waste and caving are being more widely used and every effort is made to avoid timbering. Where square sets are used they are almost always filled, the timber only serving a temporary purpose.

The system advocated by Mr. Moore presents some interesting features. It should not be difficult to frame the joints for triangular sets, and as he points out, a stronger joint can be made; but the question arises as to whether or not the triangular will be more prone to swing than the usual rectangular panels. This, of course, can only be positively proved by experience.

The Tin Position

The operation of the London Syndicate in tin during the last few months have drawn so much attention to that metal, that it is of interest to consider its actual statistical position. The figures for production and consumption are necessarily drawn chiefly from current statements of imports and exports, since a large proportion of the supplies is drawn from counties where reports of production are not available, or are not accessible until long after the period they cover is ended. Such figures must, therefore, come from what are generally known in the trade as "the statistics."

The shipments of tin and the deliveries of the metal, ordinarily included in what are known as the statistics are reported as follows for the year ended Aug. 31, 1911, in long tons:

Production	Tons
Straits to Europe and America	52,638
Australian to Europe and America	4,328
Banka and Billiton sales	16,622
Total production	73,588
Deliveries	
America	38,400
London	13,916
Holland, for distributio	15,830
Other Europe	7,172
Total deliveries	75,318
Excess of deliveries	1,730

Straits shipments to India and China are estimated at 1050 tons, making the total shipments of Straits tin 53,688 tons. In addition to the tin given above there are certain supplies which do not enter into the statistics, and these are estimated as follows: Bolivian tin delivered in Europe, 21,677 tons; Chinese tin exported, 6500; Transvaal tin, 2100; Australian tin consumed at home, 325; Cornwall production, 4500; total 35,102 tons. These supplies are usually taken as entering immediately into consumption. Adding them to the statistics given above, we have a total production for the 12 months ended with August of 108,690 tons; while the consumption was 110,420 tons, the excess of deliveries being 1730 tons. This excess was only 1.6 per cent. of the production; but the fact that the consumption exceeds the production at all helps to put tin into a strong position. In fact the margin between shipments and deliveries has been very narrow for a number of years, so that there have not been at any time considerable stocks of the metal outside of the quantities necessarily in transit or waiting delivery. This condition makes it often easy to get up a temporary corner and put up values of spot metal. The syndicate operations of the present year have been on a much larger scale, however, than such temporary and short-lived corners.

Zinc Dust Precipitation

During the early years of the cyanide process zinc shavings were used exclusively for precipitation, save in one or two cases where charcoal was tentatively employed. Although zinc dust was suggested as a precipitant as early as 1895, it is only within recent years that its adoption has made marked progress. C. W. Merrill, in an article on the subject in a recent issue of the JOURNAL, sums up the arguments in favor of zinc-dust precipitation in a convincing manner. The failure of the early trials of this process were no doubt due, as Mr. Merrill suggests, to lack of metallurgical skill.

That the process is growing rapidly in favor is shown by the fact that in most of the mining districts of this country and Mexico, there is at least one mill equipped wtih this process. In the Blacks Hills the Homestake uses dust while the other mills of the district employ shavings; in the Cripple Creek district one of the large mills uses shavings, the other dust; and in Nevada and Mexico both processes are in operation. No matter what process is used each mill seems to be satisfied with its own method. The fact that the two methods are being used in the same district may lead to one of the following conclusions: (1) Either method is good and the selection depends on individual preference; (2) one process is better for individual conditions and is therefore used; (3) prejudice has led to the acceptance of the older and more familiar method without making experiments.

Referring to the article mentioned, it is possible that an exponent of the shavings process, using the same data, would place the emphasis somewhat differently in an attempt to make his point. For instance, he might state that at a mill in Mexico using the shavings process the zinc consumption is as low as one pound per pound of bullion produced as compared with 1.2 lb. in mills in the same district using dust, and fail to state the conditions under which this was obtained.

The cost of precipitation and melting at the three mills in Mexico might also raise a question. The fact that two mills using the shavings process, supposedly working under the same conditions, show a difference of 10c. per ton in the cost would seem to indicate, either that the conditions were not exactly the same, or that in one case metallurgical supervision was superior. If the latter be true, then it might be claimed that with still greater attention to the matter of precipitation the cost could be reduced to 16c. as with the dust process. This brings out the point that in order to make a fair comparison of the two processes all the conditions must be known. The zinc-dust process has proved its worth at the Goldfield Consolidated mill and the process is likely to show greater gains as its advantages become better known.

In the editorial in the JOURNAL of Aug. 26, on "The Metallurgy of Zinc," in speaking of experiments in electric smelting, it should have been said that "In the direct smelting of ore nearly all experimenters have been troubled by the excessive production of blue powder," the qualifying adverb having been inadvertently omitted by carelessness in the proof-reading.

The production of refined copper by American refiners in the first seven months of 1911 was 837,826,981 lb., against 835,636,553 lb. in the corresponding period of 1910. In August, 1911, there was a further reduction of 5,000,000 lb. in the combined American and European surplus, which on Sept. 1, 1911, stood at 324,670,301 pounds.

Metallics

In emergencies, it is practicable to generate hydrogen sulphide by heating sulphur and paraffin together.

Tarred-paper gaskets will be found effectual when an air or oil joint persists in leaking. They may also be used on the flange joints of an air compressor. They are much better than lead gaskets.

Coarsely ground or "bran" mica is used to coat the surface of composition-roofing material, to prevent the tar or other composition used in its manufacture from sticking when the material is rolled for shipping.

The liners within a tube mill wear out at the inlet end more rapidly than at the outlet and the whole set has to be scrapped, when only one end is worn out. To increase the life of a set of liners, G. A. Robertson advocates, in the *South African Mining Journal*, arranging the tube mills in such a manner that the flow can be reversed in order to equalize the wear of the liners.

The concentrate of gold, obtained by panning, can be readily removed by a wax pencil, made by kneading a small piece of candle. The wax quickly picks up the gold. The pencil can be rolled into a ball, flattened and wrapped in waxed paper for carrying the sample to some place where an assay can be made. The wax is removed by absorbing a part of it, when molten, with blotting paper; the remainder can be burned off.

The eucalyptus oil sold for therapeutic purposes in Australia must, by a new regulation, contain not less than 50 per cent. eucalyptol. It has been found, however, that the so called phellandrene oils excluded by this regulation give better results than other oils as a reagent in the flotation processes for Broken Hill ores. It is stated that a 47 per cent. zinc concentrate is obtained with a consumption of ½ lb. eucalyptus oil per ton of material treated.

Where there are several motors of the same type, it is advisable to keep a number of bearings in stock, ready for use. Since the journals on the motor shafts wear in time, it would be impractical to bore all the bearings the same size. The best plan is to keep in stock bearing bushings standardized, say, to three sizes differing slightly in diameter; the small size to be used on new shafts, the second for shafts the journals of which have worn enough to justify turning them down to the diameter necessary to take the second standard size, and the largest size of bushing to be used in a similar way for journals that need turning a second time. In boring the sleeves an allowance should be made, in order to take care of oil and unavoidable irregularities, of 0.002 in. per inch diameter of bearing for solid sleeves and 0.003 in. per inch diameter of bearing for split sleeves.

By the Way

A London press despatch says that a coal miner, employed in a British colliery, contracted tuberculosis and that he has evolved a cure for the disease; that this cure consists primarily in breathing the gas from putrefied meat. With a great amount of respect for the author of this discovery, we wonder if the disease itself and its possible outcome are not less painful than the cure.

The classic work of Doctor Dudley as the head of the laboratories of the Pennsylvania has gone far to standardize railroad practice throughout the country. Few even among railroad men realize how greatly the whole community is in his debt. His specifications cover rails, soaps, disinfectants, oils for signals and for lubricating, paints, steel in special forms for every use, car wheels, cement, signal cord and every detail of equipment. He has made the transportation of life and property cheaper, safer and more expeditious by reason of his application of chemistry to the problems of railroad management.

In a British technical journal an advertiser suggests the following as "prospectors' requisites": Ross' "Blowpipe Handbook"; Ross' blow-pipe set; 200 minerals and rocks in deal box; "Prospectors' Handbook"; Mohs' "Hardness of Minerals"; hardness pencils, 4 in pocket leather case; clinometer and compass; scintilloscope; dichroiscope for testing precious stones. With these safely tucked away in one corner of his duffle, the prospector should not fail to discover everything. He will certainly need a strong and intelligent burro unless he leave behind him his frying pan, pick and other such nonessentials.

Comparatively few American manufacturers light their cigars with $20 bills. It is too slow a method of burning money. They prefer to burn it by shovelfuls, so they burn it in the boiler room, said Arthur D. Little in a recent lecture reviewing the "Earning Power of Chemistry." They forget that in ostensibly buying coal they are really buying heat and they pay good money for slate and sulphur balls with no knowledge of the actual number of B.t.u. they are receiving for a dollar. Or they may be like the Irish coal dealer who was asked how many B.t.u. his coal contained. "Divil a wan," he replied and many people equally ignorant depend upon a trade name ignoring the fact that coals from different mines in the same district vary greatly as does also coal from the same mine. Moreover coal, like some other things, is not always true to name.

In Australia where they seem to have as many or more labor strikes than in the United States despite the compulsory-arbitration act, a Lithgow colliery is reported to be in the throes of a strike because of the dismissal of a miner who absented himself from work. This miner happened to be the lodge delegate and asked permission to attend a board meeting. Authority to leave his work was not withheld nor granted. The miner, however, carried out the wishes of the lodge and attended the meeting. As business was not concluded on Thursday the board continued sitting on Friday. The miner in question not being able to see the manager of the mine on Thursday evening to inform him verbally of the situation, wrote him a note to the effect that it would be impossible for him to go to work on Friday. When the miner returned to work on Saturday the manager refused to allow him to enter the mine again, and the lodge accepted this as "instant dismissal," a strike order resulting. The company wrote to the secretary of the lodge regretting that the men had struck and stating that the matter could probably have been settled in five minutes if the men had gone back to work. It was further stated that the 2d. per ton extra granted to the miners in February last with a view to preventing strikes, would not be paid in future, the men having violated this understanding. The firm has also decided to prosecute the miners for striking.

Some of the overzealous Alaskan conservationists should ponder well the judgment of the head of a great railroad. President McCrea, of the Pennsylvania Railroad, recently returned from Alaska and is quoted as saying: "The great value of the country lies in its mineral resources and its fisheries. The main needs of the territory at present are intelligent mineral prospectors; the opening up of main trails by the Government, which will enable prospecting to be done with reasonable safety and without too great hardships in the transportation of food supplies; mining laws that will insure the prospector such salable title to his findings as will make prospecting remunerative and attractive and will then make the discoveries sufficiently attractive to capital to insure their development. The first difficulty in the development of Alaskan coal is, to my mind, the finding of a market. Present home consumption would be too small to justify development, and when the cost of placing the coal on cars at the mines, the interest on the cost of a railroad from the mines to tidewater and the cost of maintaining and operating the railroad are taken into consideration, I do not see how they are going to produce coal at a sufficiently attractive profit to compete in the general market with the fuel oil of California and coal from Vancouver. It seems to me that the people of the United States are being led to believe that there is a value in Alaskan coal which does not now exist and only can be made by encouraging development."

Correspondence and Discussion

Vanadium in Colorado

The mining-news service of the Colorado State Board of Immigration issued a statement under date of Sept. 1, to the effect that many large corporations were becoming interested in deposits of carnotite in Paradox valley and that teams were busy hauling the ore 50 miles to Placerville, the nearest railroad station, whence it was shipped to Liverpool via Galveston.

The sandstone was stated to contain commercial quantities of vanadium, platinum and uranium, as well as infinitesimal quantities of radium. An inquiry elicited the following letter from an officer of the General Vanadium Company of America:

We have an option on 21 claims near Norwood, San Miguel county, but unfortunately our assays do not show any platinum. The deposit, 600 ft. below the formation in which other discoveries have been made, between Sawpit and Placerville on San Miguel river, contains no vanadium.

THOMAS F. V. CURRAN.

Placerville, Colo., Sept. 3, 1911.

Colored Wrappers for Explosives

There has lately been some discussion in Western Australia and South Africa regarding the use of a colored wrapper for such explosive cartridges as dynamite to present a distinct contrast to the ore. Investigations are now being made by committees especially appointed for the work to determine how many accidents are attributable to the explosion of mislaid pieces of powder in stopes and to what extent a colored wrapper might lessen the chances of occurrence of such explosions. It is thought that a bright-colored wrapper would also reduce the chances of any stray bits of explosives reaching the crushing machinery in the mills.

The value of such a precaution would seem to depend largely upon the nature of the ore and of the material of which the wrapper is made. With ferruginous, clayey, or wet ores, the cartridge would become stained with dirt so as to completely hide the color of the wrapper.

It would be interesting to know how many accidents occur through explosives finding their way to the crushing machinery. I have rarely heard of such an accident and have never been in a mill where an explosion of that kind happened. Where ore is loaded into the mine cars through chutes it would seem that any material, like a stick of dynamite, would be broken and scattered to such an extent as to be incapable of doing any damage to crushing machinery. Certainly the colored wrapper would become so torn and soiled as to make a cartridge indistinguishable from ore by any inspection that it would be practicable to make.

There is another advantage in having powder wrappers colored so that explosives from any mine in a district may be distinguished from cartridges from neighboring mines and those sold in local stores. At many mines there is a considerable loss of explosives from theft and the stolen powder is often used for reprehensible purposes, such as fishing, etc., A distinguishing wrapper might lead to the apprehension of powder thieves.

A few years ago the Cerro de Pasco Mining Company ordered candles specially colored. The native miners were stealing such quantities of white candles, which they sold to local storekeepers, that the expense was excessive. The introduction of colored candles was followed by greatly reduced losses to the company. I have been at several mines where a large quantity of powder was stolen in such small parcels that detection was almost impossible, so that a color scheme for cartridges, such as the Cerro de Pasco company adopted for candles, might well prove to be of value for reducing the cost for powder as well as for minimizing accidents.

JOHN COWELL.

Cripple Creek, Colo., Aug. 31, 1911.

Views, Suggestions and Experiences of Readers

A Danger of Spraying to Allay Dust

In the JOURNAL of July 15, p. 100, John Graham draws attention to the danger of causing an epidemic of hookworm disease through the sprinkling of mines. That this danger is real is shown by the effect of the introduction of compulsory sprinkling at Dortmund early in 1900. In 1899 there were 94 cases of ankylostomiasis; in 1900, 275 cases, while in 1901 the number rose to 1030 and was still higher in 1902. This was partly due to the use of sump water for sprinkling.

Fortunately, it is possible to avoid this danger by mixing various substances with the water. Calcium chloride, salt, or ferrous sulphate may be used for this purpose, the first only in mines where the water is nearly free from sulphates. A 1 per cent. solution of ferrous sulphate or a 2½ per cent. solution of salt is quite strong enough. The salt or calcium chloride has the effect of keeping the roads damp considerably longer than water alone. The efficacy of a salt solution was shown in the Dolcoath epidemic, when only one mine was not affected, and there was a fairly large inflow of sea water into this mine.

The disease must exist in North America today, as it is endemic in many of the districts from which the Italian labor is drawn, and if the requisite conditions of high temperature and moisture happen to be reached in an affected mine an outbreak will take place, though the cleanly habits of the American miner may save him from such severe epidemics as have broken out in Europe.

D. F. SANDYS WIENSCH.

Knutsford, England, Aug. 27, 1911.

The Porcupine-Swastika Management

My attention has been called to a statement in the publicity section of the Swastika number of *The Mining Investor,* referring to me as having examined the claims of the Porcupine-Swastika Mining Company, Ltd., and reported favorably upon them; also referring to me as the managing director of that company. I write to say that the statement that I have reported favorably upon the claims of the company is contrary to the fact; and I am not, and have not, at any time, been managing director, or otherwise officially associated with the company; or a shareholder therein, or otherwise interested in the stock of the company. If further reference is made to me in any of these connections, I shall be compelled to place the matter in the hands of my legal adviser, and take such proceedings against parties responsible therefor as may be necessary to protect my interest.

R. B. LAMB.

Toronto, Ontario, Sept. 11, 1911.

Seeking Employment

I wish to announce to those interested, that the work of acting as a clearing house between the employer and employee, which I assumed on the departure of Mark Lamb for South America, has been taken up by the American Metallurgical Society of San Francisco.

RAYMOND C. BENNER.

University of Arizona, Tucson, Aug. 31, 1911.

American Institute of Mining Engineers

Notice is given by the secretary that the annual business meeting of the Institute, held on the third Tuesday of February, 1911, and on that day adjourned subject to the call of the board of directors, is called to reconvene at the headquarters of the Institute in the City of New York on Sept. 20. The purpose of the adjournment of the annual meeting this year, was to procure time for the consideration and formulation of certain proposed amendments to the constitution, which, if the same are to be acted upon at the annual meeting in 1912, must be formally proposed at the annual meeting held this year. Such proposed amendments have been formulated and the necessary formal notice of intention to offer the same will be given at the adjourned annual meeting, so that they can be acted on in the regular meeting in February, 1912. As these amendments are of importance, they are given substantially in full below.

ARTICLE I

"Section 1: This Institute is incorporated under the Membership Corporation Law of the State of New York; its corporate name is American Institute of Mining and Metallurgy; and its objects are such as are stated in its certificate of incorporation.

ARTICLE II

"Section 1: The membership of the Institute shall, after Sept. 1, 1912, be divided into four classes, namely: (1) Corporate members; (2) honorary members; (3) associate members; and (4) junior members. Only members of the first class (corporate members) residing within the United States of America, Republic of Mexico or Dominion of Canada, shall be entitled to vote or hold office.

"Section 2: The first class, or corporate members, shall comprise all members of the Institute as the same existed prior to Sept. 1, 1912, who shall not, at their own request, have been transferred to the class of associate members or the class of junior members; and all persons who shall thereafter be transferred to or elected to membership in this class.

"The second class, or honorary members, shall comprise the present honorary members of the Institute and such persons as shall hereafter be elected to such class. The number of honorary members shall not exceed twenty-five.

"The third class, or associate members, shall comprise all the present associates of the Institute except such as may, upon presentation to the committee on membership before Sept. 1, 1912, of satisfactory evidence of their qualifications for transferal into the class of corporate members, be duly enrolled in the class of corporate members; and such persons as shall thereafter be elected associate members.

"The fourth class, or junior members, shall comprise such present members as shall, prior to Sept. 1, 1912, express to the committee on membership their desire to become enrolled in the class of junior members, and present evidence of their qualifications to enter such class; and such persons as shall thereafter be elected to this class.

"Section 3: The following classes of persons shall be eligible for membership in the Institute, namely: As corporate members, all professional mining engineers, geologists, metallurgists or chemists, and all persons practically engaged in mining, metallurgy or metallurgical engineering. As honorary members, such persons of eminence and distinction as, in the judgment of the committee on membership, shall be deemed suitable. As associate members, all other persons desirous of being connected with the Institute who, in the opinion of the council, are suitable. As junior members, students of any of the above professions or persons engaged in learning the same. The term of junior membership shall be limited to six years.

"Section 4: Every candidate for election as a corporate member, associate member or junior member of the Institute must be proposed for election, in writing signed by three members; must be approved by the committee on membership as directed in the by-laws; and must be elected by the council. At least three-fourths of the votes cast must be in favor of a candidate to secure his election. The membership of each person so elected shall commence upon the payment of his initiation fee and current dues, as hereinafter in Article III prescribed.

"Each person proposed for election as honorary member must be recommended in writing by at least 10 members; must be approved by the council, and must be elected by ballot at a meeting of the board of directors by unanimous vote of all the directors present.

"Section 5: If any person elected a corporate member, associate member or junior member does not within 60 days after notice of his election, accept the same and pay his initiation fee and dues for the current year, his election may, in the discretion of the council, be canceled.

"Section 6: The council may at any time for reasons which, to a majority of the members thereof, seem sufficient, change the classification of any corporate member, honorary member, associate member or junior member."

ARTICLE III

"Section 1: The dues of corporate members shall, beginning with the year 1913, be $15 per annum, payable in advance on the first day of each calendar year. Each newly elected corporate member shall, when notified of his election, pay an initiation fee of $10, in addition to his dues for the current year: *Provided, however,* that each corporate member whose residence or place of business is or shall be located within 50 miles of the headquarters of the Institute in New York City, shall, so long as he shall maintain such residence or place of business, pay $20 yearly dues.

"Section 2: The dues of associate members shall be $10 per annum, payable in advance on the first day of each calendar year. Each newly elected associate member shall pay, when notified of his election, an initiation fee of $10, in addition to the dues for the current year; *Provided, however,* that each associate member whose residence or place of business is or shall be located within 50 miles of the headquarters of the Institute in New York City, shall, so long as he shall maintain such residence or place of business, pay $15 yearly dues.

"Section 3: The dues of junior members shall be $5 per annum, payable in advance on the first day of each calendar year. Junior members are not required to pay any entrance fee; but when the period during which any person shall be entitled to junior membership shall have expired, such person shall, upon being promoted to the class of corporate members, pay an initiation fee of $10, as well as the dues of a corporate member for the current year.

"Section 4: Honorary members shall be exempt from payment of fees and dues.

"Section 5: Any corporate member, associate member or junior member who shall not pay his dues within one year after they shall become due, shall, unless otherwise ordered by the council, be deprived of all privileges of membership, and if he shall continue in arrears for two years, his name shall be stricken from the roll of the Institute. Any person whose name shall have been stricken from the roll because of nonpayment of dues and for no other reason, may be restored to membership by the council on payment of all his arrears; or may, after an interval of three years, be proposed for election on the same terms as any other nonmember.

"Section 6: Any corporate member or associate member in good standing may, by the payment at one time of $250, become a life member or life associate member, as the case may be, and shall not be liable thereafter for any dues."

Proposed amendments to Articles IV, V, VIII and XI are simply verbal, to make them conform to the amendments above noted.

ARTICE XII

"Section 1: This constitution or any article or section thereof, may be amend-

ed at any annual meeting by a two-thirds vote of all the corporate members present, in person or by proxy, *Provided,* that a notice of the proposed amendment shall have been given in writing at a previous annual meeting, and *Provided, also,* that the amendment or amendments so proposed shall have been printed and mailed to all members not less than 30 days before the meeting at which the same shall be voted upon. Any amendment or amendments approved by a majority of the votes cast shall be deemed to have been adopted and shall become a part of this constitution. The secretary shall forthwith print and distribute to members an announcement of the result of such vote, and if any amendment or amendments shall have been adopted, a copy of the constitution including the said amendment or amendments shall be printed and mailed to the entire membership of the Institute."

Accident at Greenwood, Penn.

SCRANTON CORRESPONDENCE

On July 18, James Walsh was killed in the shaft of the Greenwood colliery No. 2, a mine operated by the Delaware & Hudson Company, at Greenwood, near Scranton, Penn. The coroner's jury which investigated the case has returned the verdict that the accident was avoidable, and was due partly to a defective carriage and party to wilful negligence on the part of the hoisting engineer in starting to hoist before the signal.

In the verdict the jury criticizes severely the existing mining laws applicable to the anthracite region is not requiring engineers to qualify for their responsible positions by technical examinations. It also condemns engineers attending to two jobs at the same time.

Ontario Metal Production

The output of the metalliferous mines and works of Ontario for the six months ended June 30, 1911, according to statistics of the Bureau of Mines, is shown in the accompanying table.

ONTARIO METAL PRODUCTION FOR FIRST SIX MONTHS OF 1911

	Quantity
Gold, oz.	2,276
Silver, oz.	15,231,969
Copper, tons	4,418
Nickel, tons	8,418
Iron ore, tons	94,803
Pig iron, tons	255,303
Cobalt and nickel oxides, lb.	219,584

Compared with the corresponding period of 1910 these figures show the following increases: Gold, 2276 oz.; silver, 2,417,142 oz.; iron ore, 55,306 tons; pig iron, 33,585 tons. Also decreases as follows: Copper, 216 tons; nickel, 921 tons; zinc ore, 576 tons.

The total value of the metal production was $14,355,689. In quantity the shipments from the silver mines amounted to 12,113 tons, of which 7733 tons were ore and 4380 tons concentrates. In addition 1,302,699 oz. of bullion were sent out. For the first six months of 1910 there were shipped 12,041 tons of ore and 2763 tons of concentrates. There is, therefore, a considerable falling off in actual weight, but a decided gain in value. The mines are confining their ore shipments largely to high grade, and putting the lower grade through the mills. Gowganda sent out 110 tons of ore and two tons of concentrates, and South Lorrain 216 tons of ore, the whole containing 430,540 oz. of silver. The yield of gold is still small, production at Porcupine being delayed by the disastrous fires.

Peculiar Hoisting Accident at Calumet & Hecla

SPECIAL CORRESPONDENCE

At No. 12 shaft of the South Hecla branch of the Calumet & Hecla mine, an old hoisting engine of the V-friction type has been used in the unwatering of this shaft for the protection of the adjacent workings. The hoist was handling a skip holding about 1000 gal. and attached to a 1¼-in. hoisting rope. The drum on the hoist was 8 ft. in diameter, with a friction gear attached to one end about 14 ft. in diameter. The drum was so mounted in a pit below the engine that the end containing the friction gear could be raised by a lever for engaging the friction gear with the friction pinion on the engine for hoisting; lowering was done by the free-running drum controlled by a hand-operated brake band. Recently, in hoisting a skip filled with water from the 54th level, the friction slipped when the skip had reached about the 20th level and the skip started back down the shaft, the engineer being unable to hold the weight with the brake. As the skip and rope obtained velocity, things happened at the engine house, but what happened first is a matter of conjecture. The friction gear broke into several parts, and one piece, about half the gear, went through the 24-in. side wall of the stone-masonry building and a piece weighing several hundred pounds was hurled through the roof and landed on the opposite side of a building about 150 ft. away.

The drum was torn from its bearings and went through the side of the building, the hole being shown in the photograph, and was virtually pulled through the air to the shaft house, the drum striking the ground but a few times in this distance of about 700 ft. All the pulley stands on which the rope ran were pulled down and the rope became embedded in the frame of the turn sheave, the drum finally stopping at a point about 50 ft. beyond the shaft with over 15 turns of the rope remaining on it.

The two reels shown in front of the opening in the building are empty rope spools. The drum passed over these, striking the edge of one, and landed first on the stone foundation shown in the foreground a distance of about 75 ft. from the engine house. Fortunately no one was injured in the accident.

RESULT OF HOISTING ACCIDENT AT CALUMET & HECLA

Hoisting Accident at Butte

At the Black Rock mine east of Walkerville, a recent hoisting accident resulted in the death of six men. The affair was directly traceable to disobedience of orders. The victims insisted on crowding themselves on a cage in which drill steel was being hoisted, and disregarded entirely the warnings of the cage attendant. While in the vicinity of the 300-ft. level the steel caught on the shaft timbers, and the cage was hoisted 30 ft. further before a stop could be effected. The victims were literally cut to pieces.

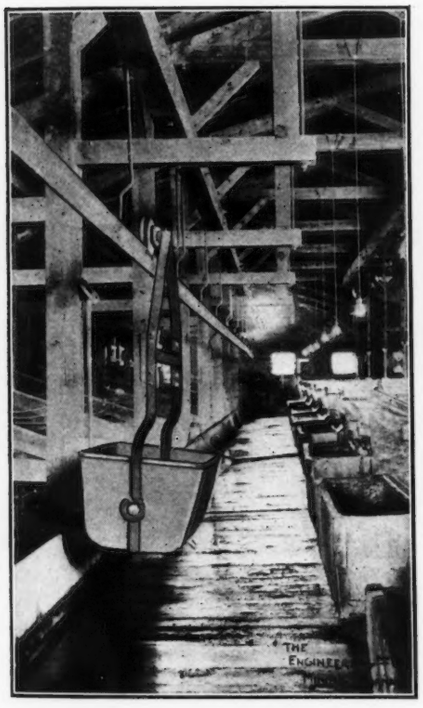
Details of Practical Mining

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent to telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

Handling Concentrates at Small Mills

While it is probably best practice to convey concentrates to the bins by means of water, this is not always possible. In such cases a wheelbarrow is resorted to at small mills to get the concentrates



TROLLEY BUCKET AT MONTANA TONOPAH MILL

from the machines to the bins or the drying room.

A method that is to be preferred to the latter, is the one employed at the Montana-Tonopah mill, at Tonopah, Nev., and at the Liberty Bell mill, at Telluride, Colo., where a tramway bucket suspended from an overhead track is used. As the illustration shows, this track is so hung that the top of the bucket is only 1½ or 2 ft. from the floor and about 3 ft. from the machines, so that the concentrates can be shoveled into it easily from the boxes.

A Tube Mill for the Laboratory

BY EVANS W. BUSKETT*

An efficient tube mill for laboratory or experimental purposes may be made by threading the ends of a piece of 12-in. pipe 28 in. long and screwing a flange on each end. The ends are closed by bolting disks of sheet steel ⅛ in. thick to the flanges. A 3½-in. flange union is then bolted to the center of each disk and into these flanges pieces of 3½-in. pipe about 18 in. long are screwed to serve as trunnions. The trunnions are carried in open bearings 8 in. long, which may be made of wood and supported by two posts or two firmly anchored carpenter horses, set so as to leave a space of about 36 in. between the inside faces. The machine is driven by a belt passing around the 12-in. pipe or body of the mill.

The mill has proved to be efficient when grinding tailing or ore. When ore is to be ground it should first be reduced by a crusher and sample grinder to pass a 16-mesh screen. As the mill has no discharge the product is apt to contain a large proportion of slime and is, therefore, not suitable for grinding ore upon which a concentration test is to be made. About 50 lb. of tube-mill pebbles are used in the mill; it will grind about 60 lb. of tailing with 50 lb. of water.

In charging, the mill is elevated by a small chain block and the pebbles, ore and water poured in. A gasket made from a piece of an old vanner belt is placed on the flange and the end bolted on when the mill is let down into the bearings. In discharging, the mill is elevated slightly, the end loosened and the pulp allowed to run into a tub placed under the mill. The end is then taken off and washed into the tub; the pebbles are taken out and placed in buckets. The tube is then washed out with clear water, the pebbles washed and their washings added to the pulp in the tub.

From this description the charging and discharging would seem long and awkward operations, but they are not. The mill can be charged in from five to 10 min., while the discharge takes about 15 minutes.

*Metallurgist, Philipsburg, Mont.

Kimberley Skip Loading Methods*

BY ALPHEUS F. WILLIAMS

At the Kimberley diamond mines it is essential to hoist the maximum quantity of blue ground in the least possible time. The fundamental principle governing the large output through a single shaft is that all the ground mined on the various levels is hoisted from only one of them.

The arrangement of the loading chute at the shaft is most important, and is shown in Fig. 1. It is absolutely necessary to have the plant as simple as possible and yet designed in such a manner as to make it possible to deal with large quantities of ground in a limited space of time and with a minimum of labor. To do this the loading chutes must be so constructed that there will be no loss of time in filling and restarting the skip after it comes to rest. Buffer beams are installed in all of the Kimberley shafts to bring the skip to rest instantaneously, the time of rest not exceeding five seconds.

In the Kimberley system the lifting of the ground to the haulage level is only resorted to in exceptional circumstances, but it is never as economical as in the case of ground dropped from levels above. If a system be adopted where a portion of the ground is being mined below the haulage level, then some form of subsidiary mechanical haulage or hoist is required to lift the ground to the main haulage level. The lifting of the ground to the haulage level is permissible only for shallow lifts, and cannot be carried too far; otherwise, there will be an appreciable increased cost per load over the system where the ground is all dropped to the level below. In estimating from what depth ground can be lifted by subsidiary haulages, it would be necessary to estimate the life of the main level, and thereafter the cost per load for handling "dropped" ground, including all interests on and redemption of money tied up in tramming levels and equipment. This cost being established, it will be easy to see when a subsidiary haulage cost would become excessive.

*Excerpts from an article entitled, "The Kimberley System of Handling Large Quantities of Ground, Etc." in the *Journal* of the South African Institute of Engineers.

Below the loading chute three sets of bearers are hitched and cemented in the rock in line with the dividers of the skip compartments. The buffer beams on which the skip lands, rest on these bearers, which also carry the station timbering of the shaft. On one side of the shaft is situated a loading chute divided into two compartments, one for loading each skip. The top of the chute at the level of the tipping track is 32 ft. long by 4 ft. wide, each compartment being 16 ft. long. This length, which may seem excessive, is required in order to prevent spillage, as the trucks discharging the rock pass the chute at a high speed. The loading chute is 22 ft. deep from the top edge to the bottom of the door, and is constructed of mild-steel plate, angles and channels. The principal wearing surfaces are protected by renewable liners of steel rails placed close together. No sliding surface of the chute is made with an angle of less than 50 deg. to the horizontal, which allows the ground to run freely. This angle is necessary in the case of blue ground, which is often wet and sticky. The discharge doors open one into each compartment of the shaft, and are hinged at the top. The doors are connected by side links to separate crank shafts, with hand capstan wheels for operating them. The action of cranks keeps the door closed while ground is being tipped into the chute. Only sufficient ground for one skipload is tipped into each chute at one time. Immediately the skip comes to rest on the buffer beams, the door is opened and swings out over the top of the skip, one skipload of ground thus being discharged. With this arrangement one white man and one native handle the whole output of the shift. A gear worked by compressed air will shortly be tried for opening these loading doors.

Below the buffer beams on which the skips rest while being filled, is a hopper of the full size of the skip compartments for catching the spillage. The bottom of the hopper has a fall toward one side of the shaft in order that the spillage may be loaded into a small skip, which is lifted and automatically tipped, delivering the ground into the main loading box. This spillage skip is worked in a separate shaft compartment and is operated by an engine situated on the haulage level. The man-cage attendant necessary on this level operates this engine in conjunction with his other duties, the total quantity of spillage being about 1.5 per cent. of the total ground handled.

From the cable-disengaging point on the "full" line of the main haulage, the tracks are graded sufficiently to allow the trucks to run by gravity past the loading chutes, tipping automatically into them, and thence passing round a complete loop to the cable-engaging point on the "empty" line of the main haulage. The track layout on the main haulage is shown in Figs. 3 and 4. The grade of this track is 1½ per cent., increasing to 3 per cent. alongside the loading chutes, in order to give the trucks sufficient speed for automatic tipping and righting. The track from the loading chutes to the engaging point on the haulage has a grade of 1½ per cent. When the trucks are passing the loading chutes, they are automatically tipped by movable tipping bars at the first, and fixed bars at the second chute, which latter, however, can be thrown out at will. The movable bars are hand-operated. When the trucks have passed the loading chutes, and are in the tipped position, they are righted again by coming into contact with a bar which is fixed alongside of the track in such a position as to lift the truck body back to the normal position. The actual labor charge—European and native—on an arrangement as above described, is about $16 per day of 12 hours, and for this charge over 10,000 loads have been handled.

The underground transportation system consists of an endless moving haulage rope to which the trucks are attached, either singly at intervals, or in trains of several together. The "full" and "empty" tracks are generally at about 5-ft. centers; 45-lb. flange rails are used, and are laid to a gage of 18 in. The trucks have a capacity of 20 cu.ft., and are side-tipping. The top of each truck body is provided with a swinging jockey, into which the haulage rope grips. The haulage rope receives its motion from a 50-h.p. electrical motor operating a self-delivering drum around which the rope passes a sufficient number of turns to give the necessary grip. The speed of the haulage rope is 2½ miles per hour.

The haulage gear is fitted with a friction clutch for the purpose of instantaneously stopping the haulage without stopping the motor. To take up and regulate the slack in the rope, a tension wheel, Figs. 5 and 6, is placed immediately behind the haulage gear; a loop of the rope is made to pass around this tension wheel, which revolves in a sliding frame, to which the necessary tension is applied by means of a weight. The distance from the tipping chutes at the main shaft, to the farthest end of the haulage at the Wesselton and Bultfontein mines,

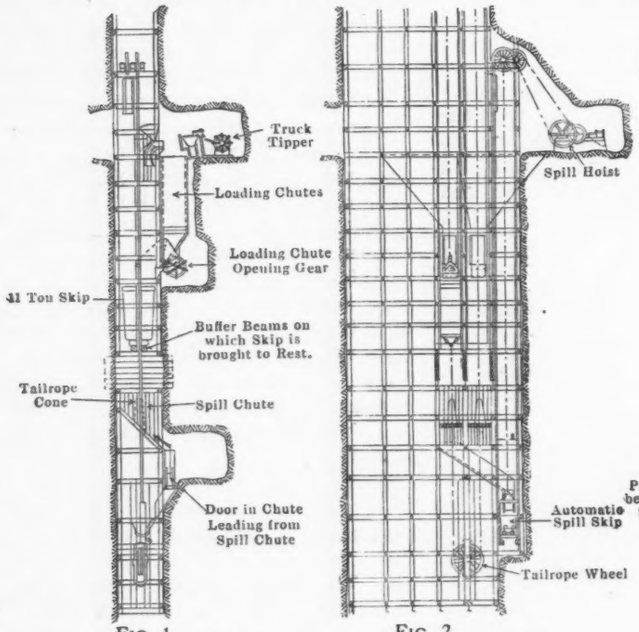


FIG. 1. Vertical Section on *A-A*

FIG. 2. Vertical Section on *B-B*

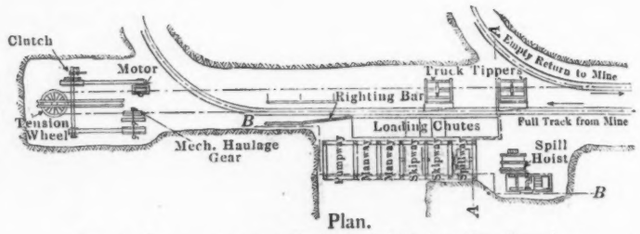


FIG. 3. Arrangement at Shaft on Main Loading Level.

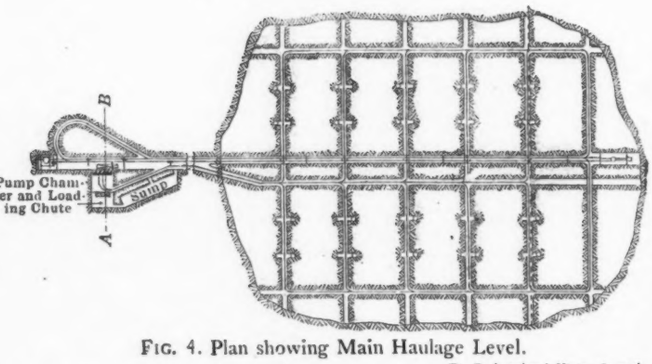


FIG. 4. Plan showing Main Haulage Level.

The Engineering & Mining Journal

STATION LAYOUT AND LOADING BINS AT THE KIMBERLY MINES

is 1800 and 2000 ft., respectively.

At the mine end of the haulage the empty trucks are raised by means of an incline to the hight necessary to allow the trucks, after leaving the disengaging point, to run by gravity past the different loading boxes, and after being filled to the "hook-on" point on the "full" line. The full trucks are raised at the shaft end of the haulage by a similar incline to allow for the necessary fall in grade from the disengaging point past the shaft loading chutes to the "hook-on" point on the "empty" line.

Electric locomotives are also used underground, and are operated by direct current at a pressure of 220 volts, receiving the current by means of an overhead trolley wire. Each locomotive has a train capacity up to thirty-five 20-cu.ft. trucks—equal to about 35 tons of blue ground. The full speed is eight miles per hour. At the Dutoitspan mine the trucks are tipped into the chutes by hand. The train of empty trucks is drawn into the mine from the shaft, and shunted into a tunnel leading by a pass, where another stand of trucks has been previously filled, sufficient track room being provided on one side of the path for a full train, and on the other side for an empty train. The locomotive makes a detour of the pass by means of a by-pass and hooks on to the train of full trucks.

As applied to most diamond mines, the mechanical rope haulage is cheaper per load, but the electric-locomotive method has much greater flexibility, and especially so if the main haulage has many curves.

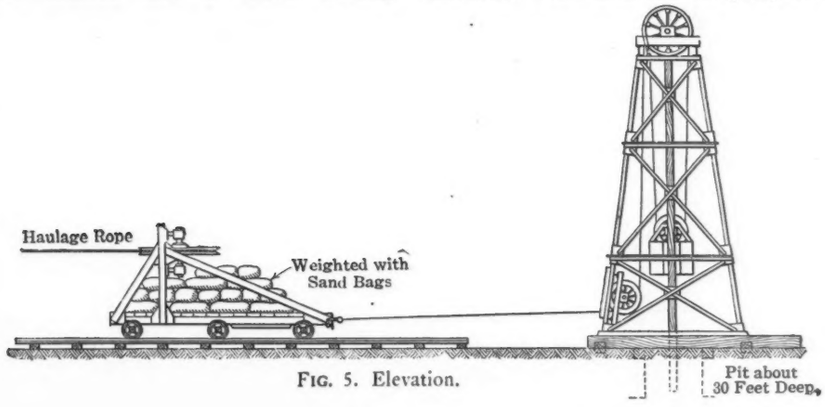


FIG. 5. Elevation.

FIG. 6. Plan

KIMBERLEY TENSION DEVICE FOR TRAM CABLE

Balls of magnesite sand, held together by anhydrous tar, are sometimes used to patch magnesia-brick furnace walls or bottoms.

Handling Silver Nuggets at Crown Reserve Mill

An interesting process for the production of bullion from silver nuggets has lately been evolved at the Crown Reserve mill at Cobalt, Ont. These nuggets, writes G. C. Bateman, are the ones that are left in the ball mill after the rest of the ore has been ground, and they are exceedingly rich in silver. It has been found cheaper to reduce these to bullion at the mine, than to ship them to the smelteries. To effect this they are placed in graphite crucibles in 400- to 500-lb. lots, and heated. No fluxes are used, but a current of hot air is forced from the blower over the top of the crucible. The waste is skimmed off, and the bullion is about 995 fine.

A Difficult Feature of Diamond Drilling

In depth and inclination, a standpipe which has been successfully driven in connection with diamond-drilling explorations near Ogdensburg, N. Y., while prospecting for zinc ore, presents unique features of interest. The pipe was started at an angle of 60 deg. from the horizontal and sunk through a deposit of sand, gravel, quicksand, boulders and a mixture of mica and sand[1]. The vein was finally reached at a depth of 372 ft., at which point a test of the angle of the pipe showed 44 deg. The accompanying sketch shows the line of the pipe, as given by tests made with clinometer.

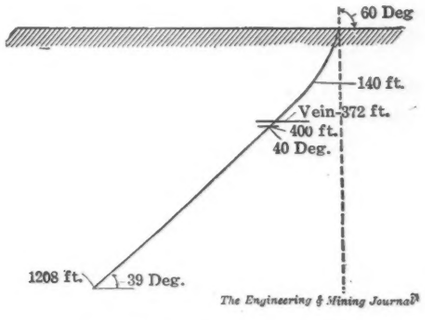
The hole was started, Aug. 4, 1910; the line of casing reached bedrock, Dec. 10, 1910, making a total of 111 working days consumed, or an average of 3.35 ft. per working day of 10 hours.

[1]W. T. Roberts in *Mine and Quarry*.

Boulders three or four feet or more in thickness were frequently met with, making the use of the diamond bit necessary in order to place a shot to break them. Between the depths of 146 and 265 ft. 50 blasts of dynamite were required to advance the pipe, employing two to three pounds of dynamite for each blast.

At one point where the formation was clay, cementing was tried in an attempt to hold the hole open until the vein was reached, but it was found when drilling out the cement that the diamond bit did not follow the cement core, but was deflected into the softer clay, thus making it necessary to advance the pipe through this material.

After the vein was reached, the casing was drilled into the limestone and cemented in place. The work was continued with the diamond bit until the hole was finished at a depth of 1208 ft., measured along the hole. It will be noticed from the diagram of the hole that from 400 ft. to the end of the hole the angle remained practically constant, there being a decrease in the angle of but 1½ deg. in 808 feet.



PROFILE OF A DEEP DRILL HOLE

The deep standpiping in this hole was not anticipated, inasmuch as two previous holes drilled nearby required only 25 and 51 ft. of standpiping respectively. Hole No. 1 was drilled at an angle of 38 deg. and hole No. 2 at an angle of 60 deg. from the horizontal. If such deep overburden could have been foreseen, other sizes of piping would have been used than those which were available, as described above.

It is interesting to note that after the vein was reached and drilling started with the diamond bit in solid rock, the rate of progress was greatly increased. It required 37 days to complete the remaining 836 ft. The crew during this time worked two shifts per day, of 10 hours each.

The progress in this latter drilling was 22.6 ft. per day, or 11.3 ft. per shift. During this time the hole was cemented twice. The drilling from 372 ft. to the finish of the hole was mostly in limestone, although occasional wide bands of quartz, hornblende, granite, and pegmatite were encountered.

A New Track Spike

A new track spike, the invention of W. H. Floessell, of Sydney, N. S. W., has been tested by W. H. Warren, professor of engineering at Sydney University, with results as shown in the accompanying table.

HOLDING POWER TESTS OF FLOESSEL TRACK SPIKE

	Pitch, Inches	Diameter of Hole in Timber	Depth, Inches	Load to Pull Out Spike, Tons	Area of Spike in Contact with Wood	Load per Sq.In. of Area
Twisted spike, ¾-in., square section	4½	23/32	4	8.02	12	1497
Twisted spike, ¾-in., square section	4½	23/32	4	8.47	12	1582
Twisted spike, ¾-in., square section	4½	23/32	4	8.10	12	1512
Twisted spike, ¾-in., square section	4½	23/32	4	8.32	12	1554
Twisted spike, ¾-in., square section	5½	23/32	4	7.92	12	1478
Twisted spike, ¾-in., square section	5½	23/32	4	8.01	12	1495
Black iron spike, ¾-in., square section	..	¾	4	6.25	12	1167
Black iron spike, circular section	..	13/16	4	6.20	11	1157

The spike is made by twisting a bar of square, hexagonal or octagonal cross-section, so as to form a helix of large pitch, and a square head is forged at the top. The original bar can be of fluted or plain section. The spike is driven into a hole bored to a depth of 4 in. in a railway sleeper; the spike revolves as it is driven into the hole.

Design of Brick Stacks

In the JOURNAL of July 22, p. 153, the table that should have accompanied the article by N. L. Stewart on the design of brick stacks, was omitted. The table is printed herewith as it contains interesting and valuable data for those who have such construction in view.

CALCULATIONS FOR 25x300 FT. STACK

Section	B	C	D	E	F	G	H	I	J
Wind pressure, lb.	26,221	53,943	83,165	113,887	146,109	179,887	215,118	251,850	251,850
Wind moment, ft.lb.	491,657	2,022,890	4,678,059	8,541,562	13,697,718	20,237,287	28,234,237	37,777,500	40,799,700
Section modulus, ft.³	628.7	914.5	1,165.3	1,603.2	2,011.6	2,465.3	2,966.3	3,497.5	13,625.0
Bearing area, sq.ft.	94.2	132.5	173.6	217.6	264.6	314.4	367.1	444.0	2,070.0
Weight, lb.	383,712	924,896	1,634,864	2,525,712	3,609,760	4,898,992	6,405,952	8,419,824	10,570 224
Wind stress, lb. per sq.ft.	782	2,212	4,014	5.327	6,809	8,209	9,518	10,801	2,994
Dead-load stress, lb. per sq.ft.	4,072	6,980	9,415	11,605	13,641	15,582	17,450	18,963	5,106
Wind stress, lb. per sq.in.	5.4	15.3	27.9	37.0	47.3	57.0	65.4	75.0	.....
Dead-load stress, lb. per sq.in.	28.2	48.5	65.4	80.6	94.7	108.2	121.1	131.7	.....
Total stress, lb. per sq.in.	33.6	63.8	93.3	117.6	142.0	165.2	186.5	206.7	.....

Sampling Gas from Wells

Irving C. Allen[1] recommends taking samples of gas from wells in the following manner:

For taking a sample of gas under pressure from an oil well a cloth funnel should be made by folding and sewing any strong, closely woven cloth into the form of a cornucopia. The larger end of this funnel should be large enough to encompass the gas pipe from which the sample is to be taken. The smaller end, or apex, of the funnel should be securely tied about one end of a flexible rubber tube 1 or 2 ft. long and ¼ to ½ in. in diameter. If there is a gas jet at the well, one end of the rubber tube may be attached directly to the jet.

A gas-sampling bottle should be procured, if practicable. If such a bottle is not at hand, a 1- or 2-qt. bottle with a well ground, tight fitting glass stopper may be used. The bottle should be thoroughly cleansed and dried. A large perfume bottle or an acid bottle, such as may be obtained from a drug store, will usually answer. A glass stopper is essential, for a cork or rubber stopper may leak, even though it appears to be hermetically sealed with wax; moreover, a cork or rubber stopper may contaminate the gas.

To collect a sample, the funnel should be tied firmly about the end of the gas pipe. The funnel and the rubber tube should then be thoroughly flushed with the gas to rid them of air. The free end of the tube should go to the bottom of the sample bottle. The bottle should be fastened bottom up and the gas allowed to blow strongly into it for at least a quarter of an hour to insure complete expulsion of air. If the gas pressure is low, the gas should be allowed to blow longer, or until it is certain that all air has been expelled from the bottle. Meanwhile the stopper of the bottle should have been well greased with vaseline.

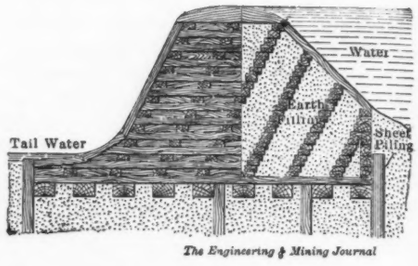
While the gas is still blowing through the tube, the tube should be slowly withdrawn. The stopper should be put in just as soon as the tube is withdrawn, and should be turned firmly into place. Then the bottle should be turned up and a spoonful of melted paraffin poured over the stopper. The stopper should be secured with elastic bands.

A simple muffler for a gas engine may be made by leading the exhaust pipe into the bottom of a barrel, filling the barrel with scrap tin, and putting in the head, through which a hole is cut for the outlet pipe. The tin breaks up the sound waves, and thus the noise is muffled.

[1] "Specifications for the Purchase of Fuel Oil, Etc.," U. S. Bureau of Mines, *Technical Paper* 3.

Earth and Timber Dam on Sand

An earth and timber dam involving no special engineering problems and which is especially adapted for use on a sand foundation is shown in the accompanying illustration. A writer in the *American Miller* says: A peculiar feature of this dam lies in its circular construction and earth filling, making an earth dam held together by timbers laid up like a laminated wheat bin. Each cell is 5x5 ft., and the earth is tamped in as the dam is raised a foot or two, a stream of water pouring into the cell during the operation.



SECTION OF AN EARTH AND TIMBER DAM

It will be noticed that the cells are not perpendicular, but lean at an angle toward the upstream side of the dam. This is intended to act as a brace to the structure and avoid getting the spikes too close together in the cross timbers. No attempt is made to have the planking on the upstream side water-tight, but that on the downstream side is carefully and strongly made, so that no water escapes and cannot be torn off by ice. The capillary action of the earth filling is depended upon to keep the cell timbers wet and away from the air, so that they will not decay.

While this particular dam, which is 700 ft. long and 19 ft. high, cost about $80,000, others on the same principle, but differently situated, need not cost much more than an ordinary timber dam. But it represents one of the best types of modern dam construction for sandy bottoms and if rightly put in will stand for generations. In places where timber is still plentiful, this principle can easily and profitably be applied to many different uses, such as wing walls and reinforcement for waterways and raised banks.

The Alaskan Coal Situation

On August 30, Secretary of the Interior Walter Fisher had accomplished the primary purpose of his visit to Alaska, which was to personally examine the coal situation and to talk with as many of those interested as he could reach. In the party which visited the Bering River coalfields were the Secretary, Governor Clark, Albert H. Brooks, of the Geological Survey, Dr. J. A. Homes, director of the U. S. Bureau of Mines, Sumner S. Smith, mine inspector for Alaska, Andrew Christenson, chief of the field division, and Myron Hibbard, mineral-land surveyer in charge of the work in the Bering field. Despatches announce the arrival of Secretary Fisher's party at Seattle on the revenue cutter "Tahoma."

Secretary Fisher convinced that value of Bering River coalfields is exaggerated. The coal is shattered and available for local use only. Oil fuel now used and will be a strong rival. Cheap fuel necessary for development of iron and copper resources.

The Bering River coalfields were not found up to expectations, says the New York *Sun*, and Mr. Fisher was forced to feel that the exaggeration of values there will prove a handicap to action, for the region has been misrepresented by the men who sought to get possession of it and by the magazines and other publications which have attempted to describe it.

Controller Bay is Not a Harbor

Such coal as is there—and there are many evidences of large deposits—will not drive either Washington or British Columbia coal out of Washington or British Columbia markets or reduce the price of any fuel now finding a market in the Puget Sound region or elsewhere. Controller bay is not a harbor, nor is it the key to anything except a huge ice field and a marsh which is valuable only as a breeding place for wild waterfowl. There is not one tree on the lands eliminated by President Taft from the forest reserve, and back of the tract is a glacier which extends up into the Chugach mountains. It is from three to four miles from high-water mark to a point at which 30 ft. of water is available for shipping and these shallows would have to be trestled with piling from Puget sound, as the local timber is very poor in quality, stunted and brittle.

The deep-water area is merely a channel, which is neither definite nor permanent. Bering river carries a large quantity of silt, as do the smaller streams coming into Controller bay. The movement of this silt causes the channel in the bay to shift so much that no geodetic survey charts made at any considerable intervals would be alike. Then there are the ice and the winds. The amount of fresh water in Controller bay causes freezing of the surface every winter. This ice moves with every tide and the movement is so strong that mile-long trestle structures would inevitably be destroyed. To build a road from Controller bay would mean to lay tracks over a wide area of marsh underlaid with silt and over the bars and flats of the intricate and shifting delta of the Bering. The so called Ryan road would reach no coal which could be shipped out of Alaska, even if it had a terminal from which shipping were possible.

Coal Cannot be Exported

No development has been done which would permit placing a valuation on the field or on any part of it. On the other hand the few tunnels and opencuts—less than 3000 ft. in the aggregate for the entire district—and the surface exposures or outcrops, present a physical condition adverse to economical mining even for local purposes and decidedly against the belief that coal can be produced which will stand shipping. The veins are both faulted and contorted, which means dead work in mining, and the local timber is almost worthless for permanent mine workings. The additional cost of the dead work and of the importation of mine timbers will prevent this coal from coming into competition with Washington coal on Puget sound, at least in the immediate future.

The deposits in the Bering region have been ground to powder by some slipping of the stratification, and for the most part the field shows this characteristic, both at the surface and beneath. Coal can be mined there with a spoon. Such coal will not stand shipment. It can be used locally for steaming purposes. The bituminous has excellent coking qualities, and its fineness does not injure it in the least for that purpose.

These conditions restrict the product of the Bering River field to Alaska consumption, and Alaska is not consuming enough coal at present to justify the outlay of many millions of dollars to haul less than 100,000 tons of coal annually from mines on Bering river to some point on tidewater from which it can be distributed. Oil is rapidly taking the place of the coal Alaska should be mining for its own consumption, and to compete with that oil the coal would have to be landed at Cordova, Valdez and Seward at a cost of $5.50 per ton, as $7 worth of oil there is equal to a ton of the best Bering River coal, test for test, and the extra cost of feeding furnaces must be taken into consideration if coal is used for steaming purposes.

Railroad Uses Fuel Oil

At Cordova, fuel-oil tanks are now under installation at a cost of $100,000 for use in operating the Copper River & Northern railroad, the vessels of the Alaska Steamship Company, and the Bonanza concentrator at Kennecott. The oil equivalent to a ton of coal at the end of the railroad costs less than $10. A ton of steam coal laid down there costs $26. It is doubtful if even Bering River coal will be able to compete with oil under present conditions, that is, considering the interest and the heavy operating and maintenance cost of a line of railroad to tap the Bering fields and bring the limited tonnage to a connection with the Copper river at Mile 46. Whatever the desire of the Alaska syndicate—the Guggenheims—may have been originally in regard to the coal, it is evident that they are not now looking for anything new to exploit. It has become a question with them of coming out whole with the heavy investments already made.

Aside from gold mining, placer and quartz, the first of which has probably seen its best days, the fisheries and furs, the Territory undoubtedly has great copper, iron and agricultural resources. The possibilities of all these were pointed out to Secretary Fisher, and it was also made apparent that their development depends upon a cheap and plentiful fuel supply. Alaska's great water powers are locked up by the ice for much of the year. Even the Treadwell supplements its water with an annual consumption of 200,000 barrels of fuel oil, and to meet oil competition there, the president of the Treadwell company told the Secretary, coal would have to come to their docks at less than $3 per ton.

A great deal of the Bering River coal will make coke. Coke will permit the development of the copper and iron industries on a large scale, but the making of coke depends upon transportation, and capital will demand assured tonnage before transportation can be developed by private enterprise. Oil has taken the place of local coal consumption. Secretary Fisher discussed these phases freely with all who talked to him as well as in his public addresses. "Let us do that thing," he repeated over and over, "which we can do today and not try to do today that which cannot be done until tomor-

row." This was in response always to the universal demand for action.

Unable to get local coal the Copper River & Northwestern has stopped work on all extensions and 5000 men have left its employ. The Bonanza concentrator is idle and the mine is shipping only 65 tons daily of high-grade ore, when it could be made to produce besides at least 100 tons daily of concentrates, which would mean the employment of a much larger force. The Jumbo, Independence and Erie are idle. They would employ 1000 men if running and give the railroad more tonnage. The Great Northern Development Company has spent a million and has 10,000 ft. of development. It is owned by Thomas F. Ryan and James Phillips. The Mother Lode could ship and its activity would require 13 miles more railroad and the Great Northern Development Company 14 miles. With cheap fuel the Ellamar, La Touche and Fidalgo Bay could increase their output, and the Barrack-Girdwood, with 3000 tons of idle ore broken in the stopes, and the Hubbard-Elliott could be shipping.

Cheap Fuel Would Increase Copper Output

With cheap fuel at hand even now the Copper River output instead of being 65 tons of ore per day from one mine would have a tonnage from a half-dozen mines and concentrators of not less than 400 tons daily and Prince William Sound mines would double their present daily output of 220 tons of low-grade ore. This would easily mean the employment of 5000 to 6000 men at mining and transportation alone, with the probable activity of several thousand more engaged in active prospecting and development.

Stagnation at Seward and Valdez was averted by gold quartz discoveries and at Katalla interest in oil alone has kept several hundred people there. Two trains a week up the road have kept Cordova alive, but as compared with three years ago these four towns and their territory have lost a population of at least 5000 in the aggregate. Already this year 1000 more persons have come out than have gone in.

The withdrawal of coal lands from entry and the impending change of policy in the manner of disposing of them by the Government is not going to work any special hardship upon any except those persons who have speculated on the possibility of obtaining the lands. Were it now possible to secure patent to every acre filed upon, the area worked or workable under natural physical and market conditions would be relatively small. When the country is forced to use briquetted coal for domestic purposes and when Alaska has greatly increased its population there will be a market for some coal in that form and it is in that form it must be marketed. In the meantime the operation of natural laws of supply and demand will conserve it automatically for those future generations so dear to the heart of the ultra conservationist.

Small Amount of Poor Timber in Chugach Reserve

In the creation of the Chugach forest reserve which is a part of this coal muddle, Alaska was unjustly treated. There is more timber value in any four average sections of Puget Sound timber than in the millions of acres which comprise the Chugach reservation. The timber is small, stunted, knotty, brittle and wholly useless for piling, lumber or ties, or in fact for any except for mere temporary use. The area on which this timber grows is not 10 per cent. of the whole and even with all the glaciers, moraines and mountain peaks and ranges which cut the reserve the agricultural lands comprised within it are of greater value than the timber would be even if its quality were good. Within that reserve, however, the lands of agricultural possibilities are as worthless to the people of the territory as the ice in its glaciers.

The cost of administering the service too is out of all proportion to the revenues derived or ever possible to derive. The area of the reserve is great and the number of men in the service necessarily small. Such ties as the railroad used cost 3⅓c. each and telephone poles ¾c. per ft. Piling was shipped into the country and so is all of the lumber used there. Here and there at widely separated points an occasional cutting is made for some purpose. A supervisor must travel from place to place to measure the timber and collect the stumpage. His expenses invariably exceed his collections.

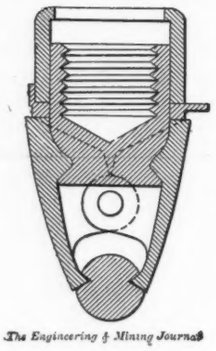
An extreme case was that of a man on La Touche Island who cut two trees without permission. Two forestry men were sent over from Cordova on a launch which was hired at $50 per day. They returned with $1.20 stumpage. Poor as the timber is, the dead tops seen from the mountains show that fully 50 per cent. of the trees are dying or are already dead.

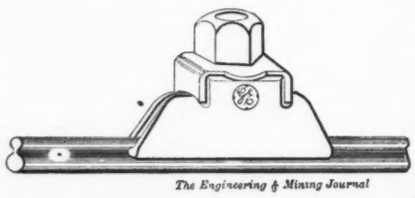
Then there is a tax of 10c. per ton, called a tonnage tax, on all goods coming into or going out of the Territory, an arbitrary tax of $100 a mile on railroads and customs regulations which make it harder to ship from Alaska to the States than from American to foreign ports.

Secretary Fisher's visit to the north has shown the necessity for formulating a definite policy for the Territory. To the settlement of some of the problems confronting Alaska and its future he has promised his best efforts. There is a feeling there of hopefulness following his visit and of admiration for his candid methods of conducting his investigation and a belief that better days are not far off.

A New Trolley Ear

The General Electric Company has recently placed on the market a new mechanical clamping ear, known as form M, especially designed for use on overhead construction in and around mining and industrial properties. The ear consists entirely of forgings and punchings of steel, thus eliminating such imperfections and variations as are common to iron castings. This feature also permits using small, light sections of great mechanical strength, resulting in an ear giving a maximum clearance from passing trolley wheels and a minimum hight from the center of the wire to the top of the clamping nut. The jaws are duplicate drop forgings, each lip fitting into the recesses of the trolley wire. The jaws are hinged by a steel pin placed close to the wire and are of a length sufficient to utilize the maximum clamping effect produced by the clamping nut.





Details of Trolley Hanger

The machine-steel stud jacket engages shoulders on the clamps and fits into the hexagonal interior of the clamping nut; thus by rotating the nut the stud jacket is drawn on to the suspension stud, while the nut exerts an outward pressure on the upper outer edge of the jaws which, by reason of the hinge, press against the trolley wire.

The punched washer is formed around the top of the jaws to prevent its turning while the clamping nut is being tightened. It is also provided with two small lugs, which may be bent up against the side of the clamping nut, effectually preventing any possibility of the ear becoming loosened in service. The new ear is made up suitable for round, grooved and figure 8 wire. The form M ear, when used in connection with form H-3 suspension of the mining-and-coiling type, renders possible an increase in headroom of one to 2½ inches.

Appraisal of Michigan Mines—II

By J. R. Finlay*

In addition to profitable copper mines, valuations are given for five companies considered promising. Data cited for unprofitable mines, principally on the south range.

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On the Osceola amygdaloid lode only one mine is working at present, namely the Calumet & Hecla. On this property the lode has been developed for a length of 9900 ft., but a considerable portion at the north end is not apparently profitable. Since December, 1900, this lode has produced 3,301,766 tons. The abandoned extension on the old Osceola mine toward the south is supposed to have produced about 4,000,000 tons. The yield of copper on Calumet & Hecla ground alone has been about 55,000,000 pounds.

This vein is not so uniform as the Kearsarge. Mr. Hague summarizes the situation as follows: "From the fact that the Osceola lode in the Tamarack workings shows a yield of about 13 lb. per ton at a depth of 6100 ft. on the dip of the lode, and from the fact that the Osceola branch of the Osceola Consolidated has been closed, the lowest workings being 4700 ft. on the dip of the vein, an arbitrary limit of 5000 ft. has been placed upon profitable mining on the Osceola lode, providing the price of copper remains the same, and provided that no material reduction in working costs takes place while operating at such depth."

On this basis, and assuming that 60 per cent. of the lode will prove mineable, it is estimated that it will yield some 23,000,000 tons, which will produce 330,000,000 lb. of copper. This will be produced in 20 years at a cost of 11c. per lb., giving the mine a present value of $5,900,000.

The Calumet Lode

This is the single conglomerate vein worked in the district. It is by far the richest in the whole region, and has paid nearly 70 per cent. of all the dividends of the Michigan mines. It has been worked by the Calumet & Hecla and Tamarack companies. The Tamarack, as mentioned above, has become unprofitable on account of great depth and the Calumet & Hecla has its possible future sharply defined. This fact is ominous for the prosperity of the district as a whole, for the failure of this great deposit is not being compensated for by new discoveries. The Tamarack mine has no payable ore at all in sight and I appraise its value at zero.

The Calumet & Hecla has on its conglomerate lode about 27,000,000 tons of ore reasonably assured, at an average estimated content of 26 lb. per ton, making a total of 702,000,000 lb. The tonnage is divided roughly between 5,000,000 tons of shaft pillars, estimated to contain 50 lb. per ton, and 22,000,000 tons of other rock in the lower portions of the mine estimated to contain only a shade over 20 lb. per ton. These figures contrast sharply with the former richness of this deposit, for 10 years ago the average yield of the Calumet & Hecla rock was 60 lb. per ton.

Costs Are Reduced

Great progress has been made in reducing costs. This mine was excellently equipped with magnificent machinery during the bonanza days and this machinery has proved ample for the ultimate requirements of the property. The development work required to extract the ore has been largely completed. As a consequence, I believe the mine can be worked out at a great profit until it is exhausted. I estimate for the remaining copper a cost of only 9c. per pound., which will leave a profit of 5c. This will give the property a profit of $35,000,000 in 20 years on this lode, giving it a present value of $21,000,000. The company also claims, and I have no reason to doubt, that it can produce 150,000,000 lb. of copper from some 30,000,000 tons of conglomerate sands now piled in Torch Lake. This can be produced at about 9c. per lb. during the next 20 years, the present value being not less than $4,500,000. The total value to be credited to the conglomerate lode, therefore, at the present time is about $25,500,000. For the whole property the valuation is $31,400,000.

Pewabic Lode

This is an amygdaloid at present worked only by the Quincy mine. It is not a single vein but a series of amygdaloid flows carrying copper for a thickness of about 200 feet.

The main lode, which contains most of the workings, is near the center of this series but perhaps inclined to be nearer the foot-wall side. The production of the Quincy mine up to the end of 1910 was 458,000,000 lb. of copper. This is exclusive of the production of the old Franklin mine, whose property is now embraced by the Quincy. I have not been able to verify the production of the Franklin, but it was apparently about 150,000,000 lb. The total output of the lode to date may be estimated at about 600,000,000 pounds.

The vital point in the present situation is that the property has been exhausted to a great depth, approximately 5200 ft. along the slope. It has long been recognized to be in a dangerous condition on account of possible caving. A few years ago the Atlantic mine suddenly closed up and was permanently abandoned by the operating company. The yield of copper per ton for the last 5,000,000 tons mined has been less than a half of the yield of the first 5,000,000 tons. The mine is well equipped and undoubtedly secures the best results obtainable under the conditions, but it is facing the three adverse factors of great depth, a declining yield and the danger of caving. The total production possible from the lode to a depth of 7000 ft., which may be taken as the ultimate profitable depth, will not exceed 200,000,000 lb. A fair present value is based on 150,000,000 lb. to be produced in seven years at a cost of 11.3c. per lb. (which is the average of the last five years) and a profit of 2.7c. per lb. The total profit expected in seven years is $4,050,000, giving it a present value of $3,250,000.

Hancock and Franklin

The Hancock Consolidated Mining Company is projecting some explorations on the Pewabic lode, but has not yet reached it. This property is nothing but a prospect, and I shall not consider it worth anything. The Franklin mine is also exploring for the Pewabic lode, but so far as present appearances go the Quincy owns all the ground which is likely to be profitable.

Isle Royale and Baltic Lodes

The above described deposits are all northeast of Portage lake. The only two lodes being worked southwest of Portage lake with any pretensions to success are the Isle Royale and Baltic. The Isle Royale was discovered in the early days and has been worked without success for 50 years. Its record for the last five years shows a cost of 16.7c. per lb. for 21,902,000 lb. of copper. On this record it might be put down as unprofitable, but there is another side to it. The output has been brought up from 192,000 tons in 1906 to 521,000 tons in 1910. The yield of copper per ton has remained substantially the same and shows an average for five years of 14.6 lb. per ton. The cost in 1910 was only 11.8c. per lb., which seems warranted by the yield of the rock. This indicates that the mine has some value. It seems reasonable to expect that it will produce 112,000,000 lb. above the 4000-ft. level in 16 years at a cost of 12c. per lb. This indicates a total profit of $2,240,000 and present value of $1,450,000. The Baltic is the

last important vein discovered in the country. It was opened up about 1897, although some former unsuccessful work has been done upon it. Four mines are situated upon this lode, viz., Superior, Baltic, Trimountain and Champion.

Superior Mine

Mr. Hague comments upon the Superior as follows: "This property is in the prospective stage, though a promising one. One shaft has been put down about 15 levels and 286,566 tons of ore, yielding 5,602,408 lb. of copper, have been hoisted from drifting, as practically no stoping has been done. This is about 19.5 lb. copper per ton. Depth and lateral extent must be obtained before any definite statements can be made as to life or yield. About 1400 ft. laterally on the vein have been opened to date. If the Baltic may be used as a standard for this property, the following figures may be used for the tonnage developed: 1,900,000 tons at 19⅓ lb. equals 37,000,000 lb. of copper."

One unfavorable feature about this property is that the outcrop of payable ore is short. On the theory that the depth of an oreshoot has some relation to its length, there is some reason to fear that the mine may not prove extensive. It is, therefore, hazardous to count upon an indefinite extension downward. It seems fair that the probable value of the property should be based on an expected output of 75,000,000 lb., this being twice the amount now opened up. Since the property is not equipped, it is probable that 2c. per lb., or a total of $1,500,000 should be allowed. Therefore, the total expected cost may be put at 12c. per lb., leaving an average profit of 2c. per lb., or $1,500,000 to be obtained in 15 years. This would give the property a present value of about $1,000,000.

Copper Range Consolidated

The Copper Range Consolidated Company owns the Baltic, Trimountain and Champion mines. Each of these works upon a separate oreshoot, which, together cover a length of more than three miles along the vein. Taking these three orebodies in the aggregate, the length is such that one would be disposed to concede the probability of the ore extending to a great depth. However, the oreshoots are separated by large stretches of entirely barren ground. The oreshoot of the Trimountain, which is the central one of the three, weakened abruptly at a depth of about 700 ft., and the mine has become practically unpayable. I quote the following notes taken after an inspection of the bottom levels of the Champion and Baltic mines: Champion —"Present oreshoot is bottomed at B shaft at about 11th level. At E shaft it goes down to the 18th level and there plays out. No assurance of any further ore in depth." Baltic—"Present oreshoot is bottomed on south end of mine as far north as No. 3 shaft at 22d level. No. 4 shaft still has ore in bottom, but gives signs of weakening. No assurance of any further ore in depth."

The management, however, is not disposed to take these unfavorable developments seriously, but fully expects to find better ore at greater depth in all three mines. Under these circumstances I do not feel disposed to express an opinion as to the future of these properties, except that the continuity is not so well demonstrated as in the case of mines north of Portage lake. There are undoubtedly large gaps of barren territory in the vein separating the richer orebodies both laterally and vertically. It is to be remembered that these mines are well managed and have been very profitable, so that a considerable falling off in yield can be withstood before the profits will be extinguished.

Baltic, Trimountain and Champion Mines

Mr. Hague estimates ore reserves of the Baltic mine at 3,400,000 tons reasonably assured at 22 lb. per ton, making 75,000,000 lb. of copper. If we assume that this is reasonably certain to be extended to 5,000,000 tons and 110,000,000 lb. of copper, we get an assured life of about seven years. The cost of production is less than 9c. per lb., profits 5c. per lb. This gives an expected profit in seven years of $5,500,000. It is perhaps reasonable to expect that further discoveries will enable the company to make additional profits, which will be sufficient to pay interest on a full valuation of this property after the seven years have expired. It seems, therefore, fair to give the mine a full valuation of $5,000,000. The Trimountain mine has been able to maintain a cost per lb. copper at about 12.8c. for the last five years, but with a diminishing output both of tonnage and copper. The future of the mine is entirely prospective except for about 16,000,000 lb. of copper which may be obtained in the next four years at a profit of $192,000. The present value is $165,000. Mr. Hague's estimates of ore reasonably assured on this property are 5,000,000 tons, which will produce 110,000,000 lb. of copper. The same assumptions can be made for the Baltic as regards cost and the valuation can be placed at the same figure, viz., $5,000,000.

Lake Mine

Another property situated about 20 miles southwest of the Copper Range group is generally supposed to be valuable. This is the Lake property. It is not by any means assured that this mine will ever pay a dividend. From this mine, 14,485 tons of rock were shipped and stamped with a yield of 318,050 lb. of copper, this being an average of 21.95 lb. per ton. If a large tonnage of ore of this grade could be secured and mined at average cost, this property would unquestionably be valuable. But it is stated by the management that the ore shipped to the mills was selected and cannot be taken as a fair average of the mine. At present all effort is being directed toward equipping and opening the mine on a sufficient scale to place mining on an economical basis. Ore will then be sent to one of the Copper Range mills. The cost of freight will be from 15 to 20c. per ton. It is not probable that under these circumstances, operating costs will be less than $2.10 per ton. This will make 15 lb. per ton the smallest yield that can possibly meet expenses. It is hoped that this mine will prove to be something like the Baltic, in which case about 2,000,000 tons may be conceded to be opened up, which might yield about 40,000,000 lb. of copper. Conceding that this product may be obtained at a profit of 1c. per lb. during the next 10 years, we get a present value of about $300,000 for this property.

Valuations of the Copper Mines

Valuations of the individual mines and the total follow: Mohawk, $3,500,000; Ahmeek, $7,200,000; Allouez, $1,500,000; Wolverine, $3,700,000; Osceola Consolidated, $6,000,000; Calumet & Hecla, $31,400,000; Quincy, $3,250,000; Isle Royale, $1,450,000; Superior, $1,000,000; Baltic, $5,000,000; Trimountain, $165,000; Champion, $5,000,000; Lake, $300,000; Atlantic, $350,000; total, $69,815,000.

Unprofitable Copper Mines

Several companies have mined copper at a loss even during the high prices of the last five years. This fact was ascertained early in the investigation, and unless the record showed some signs of progressive improvement no particular attention was paid to these concerns. The Franklin Junior mine has been working a conglomerate lode between Hancock and Calumet. During the last five years it produced 15,258,000 lb. of copper at an average cost of 16.7c. per pound. The output declined from 4,571,000 lb. in 1906 to 966,000 pounds in 1910. This record is such that a mine can be classed as absolutely unprofitable, and I appraise it at zero.

The Atlantic Mining Company makes the following report: "The Atlantic mine caved in May 26, 1906, and the work done since has been entirely of an exploratory nature except that the stamp mill has been doing some custom work, and this work shows no profits. It was done to keep the mill in condition to use if anything of value was found on ore lands. Explorations are now all stopped and the machinery is being dismantled." This mine was formerly profitable but suddenly caved in as above described, because the openings had become too extensive. This property has recently been absorbed by the Copper Range Consoli-

dated. The consideration was an issue of 10,000 shares of stock of the latter company equal to 2½ per cent. of its capital. As the Copper Range Consolidated owns the Baltic and the Trimountain mines, and a half of the Champion mine, together with the Copper Range Railroad, it is plain that the valuation to be put on the Atlantic is 2½ per cent. of the total valuation of the Copper Range Consolidated. As this includes appraisement of the railroad company, I cannot state exactly what the amount should be, but based upon the valuation I have put upon the above mentioned mines, it should apparently be about $350,000. This valuation covers 962 acres of mineral land and a mine which is stated to be as good at the bottom as it ever was, but needs to be reopened from the surface.

The Winona Copper Company produced during 1906, 278,182 lb. of copper at a cost of $1.05 per pound; in 1907, 219,332 lb. of copper at a cost of 32c. per pound; in 1908, 39,310 lb. of copper at a cost of more than $5 per pound. It has been developed by two shafts No. 3, 1272 ft. deep and No. 4, 1460 ft. deep. The rock mined during the last year of production, 1907, produced 12.6 lb. of copper per ton. This record shows the mine to be absolutely unprofitable. The King Philip Copper Company has spent during the last five years $909,840 and is developed by two shafts, No. 1, 124 ft. deep, and No. 2, 1324 ft. deep. The latter showed ground like that opened in the Winona mine. This mine evidently has no value, the only hope being a remote one of finding better rock. The large amount of exploration done on the Winona and King Philip would ordinarily be considered a sufficient demonstration of the possibilities.

Ashbed, Tamarack and La Salle

The Ashbed Mining Company attempted a little mining in 1906 and in 1907, producing 1600 lb. of copper in 1907 at a total cost for the period under review of more than $8 per lb. In 1907 mining operations were discontinued and have not since been renewed. The Tamarack Mining Company, which formerly paid large dividends, has become distinctly unprofitable during the period under review. It is still producting considerable copper, having produced 58,314,000 lb. during the last five years. Its average cost has been 15.2c. per lb. In 1906 the cost was 15.29c.; in 1907, 16.98c.; in 1908 15.53c.; in 1909, 14.1c.; in 1910, 14.53c. Undoubtedly the management hopes to reduce the cost and make some profit, but I am not willing to appraise hopes when contradicted by the figures on such scale as this. I, therefore, value the mine at zero. The La Salle Copper Company produced 791,000 lb. of copper during 1909 and 1910, at a total cost of 35.25c. per lb. This property has a large acreage on the Kearsarge, Osceola and Calumet lodes. The southern end has still no promise. Nos. 1 and 2 shafts are down 2000 ft. and 1400 ft. respectively; about 17,000 ft. of drifting have been done and out of 181,075 tons of rock hoisted, 64,598 tons were treated as ore, yielding 10.8 lb. of copper per ton. If this record demonstrated anything, it demonstrates that the property is hopelessly unprofitable and I appraise it at zero.

Gratiot, Centennial and Victoria

The Gratiot Copper Company produced in 1910, 29,869 tons of ore which were stamped, yielding 283,615 lb. of copper, this being a recovery of 9.5 lb. per ton. Operations were suspended April 1, 1911, apparently with good reason, and I appraise this property at zero.

The Centennial Copper Mining Company occupies 640 acres of land at the south end of the Kearsarge lode. It adjoins the South Kearsarge and Wolverine mines on the west and it would be strange if none of the ore worked by those companies cross the line. However, the record of this company shows no promise. During the last five years, 10,980,000 lb. of copper have been produced at a cost of 18.4c. per lb., the total loss in five years being about $290,000. While admitting that this mine may become profitable, this even depends entirely on the extent to which the Wolverine orebody may cross over upon its ground. It is not by any means impossible that it may never do this as some of the ore shoots take a course almost due north, in which case the Wolverine orebody might continue in a direction parallel to the Centennial boundary. I therefore, appraise the value of this mine at zero.

The Victoria Copper Mining Company has produced in the last five years 5,270,000 lb. of copper at a cost of 19c. per lb.; the average yield is 10.9 lb. per ton. This record shows the mine to be hopelessly unprofitable.

Mass and Michigan

The Mass Consolidated Mining Company has produced during the last five years 10,988,000 lb. of copper at an average cost of 18.3c. per lb. This mine has been securing about the same results for the last 12 years and has called assessments for the amount of $2,100,000. Its record shows it to be hopelessly unprofitable, and I appraise it at zero. The Michigan Copper Company has produced during the five years under review, 10,561,000 lb. of copper at an average cost of 20.7c. per lb. Mining operations were suspended in 1910, having continued for about 12 years They cannot be considered as anything more than an experiment on a grand scale, which proved the property to be hopelessly unprofitable. This company undertook to reopen the old Minnesota mine, which was closed down about 30 or 40 years ago after paying more than $1,700,000 in dividends. The mine at that time was given up as worked out. It was supposed that improvements in methods and facilities would make the veins payable again. This belief has cost the stockholders of the Michigan more than $2,000,000.

I give the above details of these various properties to show at a glance the conclusive character of the evidence in regard to nearly all of them. To attempt to place a valuation upon properties which have no better record than most of those mentioned would only be a joke. In most cases these operations are simply costly experiments more or less complete, undertaken in the hope of developing a profitable mine. When the experiments are carried along beyond the period when the demonstration is thorough, the continuance is a psychological phenomenon.

Nonproducing Copper Companies

You will find in the data submitted with this a long list of copper-mining companies which have not produced during the five years I have reviewed. Some of them have produced in the past, but have closed down permanently; others have produced nothing at all. I have sought for some logical means for placing an acreage value on the undeveloped or demonstrated lands situated upon the copper-bearing rocks without success. It may be taken for granted that the long list of unprofitable enterprises mentioned above were undertaken upon the best showings of copper that could be found outside of the tracts owned by the profitable mines.

It seems ridiculous to place a valuation upon lands which have no showing at all when costly operations upon lands that have considerable showings of copper have not proved those showings to have any value, but, on the contrary, in most cases have proved them not to have any value. The fact is that the copper district has been pretty thoroughly explored. The only surely valuable deposits discovered in the last 30 years were those on the Baltic lode. The discovery of these mines, together with a theory that the mining business could be put on an improved basis through the installation of power plants designed to handle a larger tonnage, caused a boom in the district, which lasted pretty continuously from 1898 to 1907. The hopes entertained during this period inspired the expenditures of vast sums of money for explorations, the result of which has been meagre. It is probable that the people of the district have not fully recovered from the speculative mania which lasted so long. Many owners of mineral rights undoubtedly hope to dispose of them for fancy prices. This is largely because in the past promoters have been able to float mining companies and sell their shares to the public. They have actually preferred in many cases to pay owners large

sums in cash for their lands rather than to issue stock for them. This kind of a market has no reference whatever to the intrinsic value of the properties.

I take the ground that the State of Michigan does not wish to recognize extrinsic valuations created by promoters whose business is not to produce copper but to gage the public appetite for speculation.

Mineral Rights Owned by Holding Companies

The St. Mary's Mineral Land Company owns all of the St. Mary's Canal Company and half the stock of the Champion Copper Company. The St. Mary's Canal Company owns about 86,000 acres of land in fee simple and 14,000 acres of land, the surface of which has been sold, but the mineral rights reserved. Such companies are rarely popular. It is easy to create in the minds of the people the suspicion that such companies are holding large tracts of land for high prices and thereby impeding proper development, and, in a word, living on the "unearned increment." In the case of the St. Mary's Mineral Land Company, this suspicion is hardly justified by the facts.

A careful inspection of the record of this concern shows that during the last four years it has earned nothing applicable to dividends except a portion of its dividends from the Champion Copper Company, which, of course, is appraised separately. Its total receipts, from sources other than the Champion Copper dividends are as follows: Land sales, $227,398; for wood and timber, $27,253; notes, $66,000; ground rent, $9330; interest and sundries, $59,785; total, $389,768. But its expenditures in the attempt to open up new mines have been large. Following are its disbursements, including the assessments paid during these years on shares in copper companies: King Philip, $672,714; Winona, $6736; Hancock Consolidated, $160,000; Ojibway, $4000; Houghton Copper, $55,555; Challenge, $138,000; office, $57,792; taxes, $86,921; Franklin district, $2220; total, $1,176,939. This statement proves that the company has lost $787,171.44, excluding the Champion dividends. This statement rather effectively disposes of the argument that this company is a "dead weight" on the community and is living on "unearned increment."

(To be continued)

Bavarian Mineral Production

The official figures for the Bavarian 1910 mineral production, just issued, show that the most valuable product was lignite coal, of which 1,229,970 metric tons were produced, valued at 10,179,470 marks. Of the various metal-ore productions the only one of any commercial importance was that of iron, of which 303,844 metric tons were produced. Nonmetallic mineral products were as follows, only those being given of which the year's output exceed one million marks: Anthracite coal, 713,994 metric tons; potter's clay, 274,641 metric tons; limestone, 967,689; sandstone, 492,581; basalt, 800,886; granite, 351,600; lithographer's stone, 9790 tons. The value of this last item was 1,319,962 marks. The total tonnage of the various clays and stones produced was 4, 268,889 metric tons, with a total value of 15,917,809 marks.

Tennessee Mineral Production

The mine production of gold, silver, copper and zinc in Tennessee in 1910, according to H. D. McCaskey, of the U. S. Geological Survey, was valued at $2,289,731, a decrease of $305,619 from the corresponding value for 1909. The gold production was 150.6 oz.; the silver, 81,239 oz.; the copper, 16,837,727 lb.; and the zinc, figured as spelter, 1,932,555 lb. When compared with the corresponding figures for 1909 these figures show decreases of 48.6 oz. in gold and of 2,369,079 lb. in copper; but increases of 23,602 oz. in silver and of 740,394 lb. in zinc. In 1910, 552,796 tons of copper ore and 25,638 tons of zinc ore were mined.

The total production of coal in 1910 was 7,121,380 tons, valued at $7,925,350, an increase of 12 per cent. over the production of 1909, when the output amounted to 6,358,645 tons. The coal production in 1910 was the largest in the history of the State, and although in some districts the ability to absorb the increased output was somewhat overtaxed and prices suffered accordingly, the record for the State as a whole was a decided improvement over 1909. The death rate per thousand in 1910 was 3.19 and the quantity of coal produced for each life lost was 190,036 tons.

California Oil Dividends

The California oil companies paid dividends in August as shown in the accompanying table, according to the San Francisco *Chronicle*.

CALIFORNIA OIL DIVIDENDS

Company	Per share	Amount
Central	$1.50	$15,738
Claremont	0.02	10,000
Columbia	0.01	9,992
Homestake	0.10	2,000
Linda Vista	0.01	2,500
Mascot	0.02	10,000
*Mid Central	0.01	5,007
Monte Cristo	0.05	25,000
*Mount Diablo	0.02	9,350
Mex. Pet. Ltd., pfd.	0.66	80,000
New Pennsylvania	0.005	2,498
Palmer	0.01	18,020
Paraffine	0.01	3,000
Sauer Dough	0.025	4,987
Section 25	....	10,000
*State Consolidated	0.66	4,337
Union Oil	0.006	181,016
Union Provident	....	89,620
United Petroleum	....	48,451
Western Union	0.005	5,000
W. K.	....	15,000
Total		$551,516

*Unlisted stocks.

Francis L. Robbins

Francis Le Baron Robbins died at Chicago, Sept. 8, aged 56 years. He was born at Ripon, Wis., but when a boy moved to Pennsylvania, where his father had bought a coal mine in partnership with the late John Arnott. Young Robbins entered the employ of the firm, and when 20 years old was superintendent of the Pittsburg & Walnut Hill Coal Company. A few years later he bought two mines, and organized the Robbins Coal and the Willow Grove Coal companies. He continued to operate these mines for a number of years, later acquiring also an interest in the Pittsburg Consolidated Coal Company. He was the chief promoter in the big consolidation, which resulted in the formation of the Pittsburg Coal Company in 1899. On its organization he was made chairman of the board of directors, and a year later was chosen president and chief executive officer of the company.

Mr. Robbins was always a friend and supporter of trade unions, and for years made a practice of meeting his employees in conferences. He was largely instrumental in the formation of the Interstate agreement, under which coal mining in the Central West was conducted for several years. In 1906, however, during the long wrangle over the wage scales, Mr. Robbins, as representative of the Pittsburg district, broke loose from the conference and made a separate agreement for that district; a course which led to the breaking up of the Interstate agreement. Resenting this action the Ohio, Indiana and Illinois operators refused to act longer with him, and made John H. Winder, of Ohio, their leader. The controversies which followed the convention of 1906 led to Mr. Robbins' retirement from the presidency of the Pittsburg Coal Company in 1907. For a year thereafter he was president of the Monongahela River Consolidated Coal and Coke Company, retiring from that position on account of ill health.

After a short rest he took up a project for the organization of a large company to operate coal mines in Alabama and a cement plant near Mobile. This was well advanced, when he was again compelled to retire by the condition of his health, some months ago.

Mr. Robbins was probably better acquainted with the conditions surrounding the western coal trade than any other man in the trade. His management of the great Pittsburg Coal Company was successful in the face of the handicaps of two or three successive bad years and the original mistake of over-capitalization; the last, it is said, was not due to him, but rather to the bankers who financed the consolidation. He was active in politics and took part in several national campaigns. He was also prominent in the organization of the National Civic Federation.

A Proposed Method of Timbering

By A. J. Moore

A proposed modification of the square-set system of timbering stopes described, wherein the legs of the usual square set are to be replaced by diagonals making; with the caps, triangular panels separated by struts. Fifty years ago Deidesheimer used diagonal members in the square sets in a stope at the Ophir mine.

NOTE—From the *Proceedings* of the Australian Institute of Mining Engineers, June, 1911.

When I first saw square sets, I was at once impressed with the fact that the frames made by the sets, along the lode and across it, were composed of panels with rectangular openings, and it was puzzling to understand how such a collapsible structure could resist pressure that came unevenly on it. Later I learned that the sets did not satisfactorily resist such pressure, but filling had, to a great extent, to undertake this duty for them. So it appeared that the sets were practically an expensive scaffolding, enabling the miners to work in the face and carry the stope forward, till the filling was put in behind them to take the pressure of the roof and sides of the excavation. Of course, some of the pressure is taken by the sets, but this is because the set timbers prevent the filling being done perfectly; if it were practicable to remove the sets before filling, the filling by itself would more effectively support the back and wall, than do the combined sets and filling. On the whole, therefore, the sets can hardly be said to be of much benefit where pressure has to be resisted. Despite this, the system has been of immense service in mining wide lodes, but for all that, it can only be pronounced a makeshift. This is no reflection on Deidesheimer, the originator of the square set, for, as will be shown later on, this way of using the square set was not his way.

Little Pressure upon Square-set Struts

I have often tried to think out a way of applying the triangle to the sets, but, as it appeared necessary to do this along the lode, as well as across it, the problem was apparently quite insoluble; however, when the fact was properly appreciated, that the pressure strutways (along the lode) was usually insignificant compared to the pressure of the back, and hanging wall, the problem was simplified; and by treating the caps and legs as a series of frames supporting these two weights—to which frame the struts act merely as distance pieces—it was then seen that it was only necessary to triangulate these cross frames. This was done as shown in Fig. 4, by dispensing with the leg, and substituting two diagonals.

There is nothing original in the triangulation principle, because (according to W. H. Storms) it is the principle that Deidesheimer adopted, 50 years ago, in his first application of the square-set system. His manner of application, however, was different, as he secured the triangulation by putting a diagonal piece in every panel across the lode, and also had wall plates up the hanging wall, and foot wall, into which each frame, made by the caps, legs and diagonals, was jointed. This jointing was elaborate, and made the wall plates an expensive matter. For this reason they have long since been discarded, and, in addition, the systematic use of the diagonals was dropped. These deprivations greatly weakened the frames, and it was soon learned, from disastrous experience, that the sets could not stand without the aid of filling. But it is proved sufficiently that the principle applied by Deidesheimer was the right one, by the fact that the big stope, which was from 60 to over 100 ft. wide and several hundred feet long—timbered under his personal supervision at the Ophir mine—was not filled till it had reached the great hight of 400 ft. It was only a phenomenally rich stope, such as this, that could bear the expense of such elaborate timbering, and unsatisfactory as is the present system of skeleton sets—plus filling—it must be a considerably cheaper method.

Principle of Square-set Timbering

I believe that my way of applying the principle combines the strength of the Deidesheimer system with the cheapness of the later method, and has additional advantages of strength and convenience, due to the fact that the diagonals are in two directions.

Before going into the details of the proposed construction, it is interesting to notice the effect the triangulation principle has on the frames. Fig. 1 represents a cross-section of a stope timbered: (*a*) With the ordinary square set; (*b*) with the proposed modification of the square set; (*c*) with the Deidesheimer sets; *M* is a loose cylinder of rock whose weight comes on the corner *A* of a set in each case.

In case (*a*), this weight will be supported by the line of caps *A C* and line of legs *A B*. All the other members of the frame, being at right angles to one or other of these, are unable to give any assistance to them.

In case (*b*) the weight is supported as before by *A C* and *A B*. In a high stope it will be seen that in this case *A B* will get to solid support on the foot wall in a shorter distance than in case (*a*). But there is more in it than this. Suppose for some reason that any link—say *m n*—of *A C* or *A B* fails. The pressure along *A m* would then be split along *m p* and *m q*, and similarly at *p* and *q*, there are three members that are capable of sharing the stress, and if these ramifications are followed up, it will be found that every member of the frame can share in the stress applied at *A*.

In case (*c*) similarly, all the members inclosed between *A B* and *A C* and the foot wall can share the stress. But the members above *A C* and on the hanging-wall side of *A B* are not able to lend any assistance.

Where an isolated weight from the back comes on a joint, the superiority of the proposed construction is further demonstrated. In case (*a*) the line of the legs directly under the weight, alone supports it. In case (*b*) every member as before shares the stress. In case (*c*) all the members on the hanging-wall side of the line of legs immediately below the weight, do not give any assistance.

In fact it almost appears in case (*b*) as though the weight of the hanging wall and the weight of the back become mutually supporting, and possibly it would be found that when these pressures come unevenly on the various corners of the sets, the stress is, however, distributed evenly over the frame. In any case it is apparent that the form of construction of (*b*) has great superiority in strength and stability over that of case (*a*) and in a lesser degree over that of case (*c*).

Construction of Triangular Sets

The proposed construction of the set is shown in Fig. 4. The caps and struts are of 10x8-in. timbers, the diagonals of 10x6-in., all of them put in with their wide sides down. The angle of the diagonals may be whatever best suits the particular case to be dealt with. Properly, the angle should correspond to the angle of the hanging wall, but in practice this will not always be convenient. The angle that the diagonals in the figure makes with the horizontal (and which I think will be found suitable to most cases) is 65 deg. Taking the center lines of the caps as 8 ft. apart vertically, this will give a cap length of 7 ft. 6 in., strutways the caps are 5-ft. centers; 6 ft. would not be, perhaps, too much, but it gives too great a span between the drift sets.

Weakness of the Square-set Joint

The joint is, of course, the vital part of the set; but before going into that question, it is as well to point out one or two things about the present joint. Fig. 2 is an isometric projection of this joint; it is designed to resist top pressure mainly. In America this form is seldom used, and in that country the joint has been greatly varied at different fields to suit local requirements. With the joint shown in Fig. 2 the leg becomes the weakest member of the set, whereas it should be the strongest; while the strut is the strongest, though it should be the weakest. It is in the 4x4-in. spill that the leg is weak. If the face be heavy, it is necessary to put in face boards whose ends press on the legs, and if there be much weight on the boards there is only the strength of the 4x4-in. spill in resistance, and a breakage in such a case is fairly common. Similarly, when a rock is blasted from the face against the leg, there is only the spill to resist breakage. In the former case it is often necessary to put under the cap a 10x12-in. or 10x4-in. liner whose ends bear against the full width of the legs. In the case of the cap, a liner is also often necessary when a heavy back weight comes on it; the 1-in. hold the cap has (at the sides of the spill) on the shoulder of the leg is not sufficient as that part of the top of the leg will chip away, and the cap tends to sink into the leg.

Strength of the Triangular-set Joint

The projection of the proposed joint is shown in Fig. 3 (*a*). As the top pressure becomes translated partly into side pressure, and *vice versa*, there is no need to design the joint to resist either in particular. It is convenient to have the caps butting against one another. This is done by spills of 5x5-in. section and 3½ in. deep. The strut spill is 7x5in. and 2½ in. deep. These dimensions allow the ends of the diagonals to be housed in for a depth of 1½ in. The area of the faces of the diagonals pressing against one another, is 10x5 in. The cap has a bearing surface for its full width of over 2 in. (taking in the bevel) on the diagonal, in addition to its spill bearing. The cap's full depth also bears against the strut shoulder practically for 1½ in. It will be seen, therefore, that the cap has its full section to depend on for a blow from the face, or for any weight on its top side. Similarly the diagonal opposes a section of 10x5-in. area to the side weight; this section has about eight times the strength of the 4x4-in. spill section. It will be seen also that the caps and diagonals are edge on to the face and can stand a heavier blow than if lying the other way. Further, if there is any tendency of the diagonals to crush the joint (which is unlikely, as the pressure cannot be concentrated on single lines as in the ordinary set), this across-grain pressure becomes to a great extent translated into a pressure along the grain, by means of the beveled face on the cap. The strut spill is not so strong as in the square-set case, but is strong enough.

This joint will be more expensive to cut. The diagonals are simpler and cheaper to cut than the legs, but the strut is a little more expensive, and the cap more so. I believe that the increase of expense will not be marked, and will by no means counterbalance the advantages of the joint. A cheaper form of the joint is shown at Fig. 3 (*b*). This gives a strut spill of 8½x5 in., but reduces the full width-bearing of the cap on the diagonal to the beveled surface, which is, however, over 1½ in. in depth. Two more variations of the joint are possible by making the cap spill 6x6-in. section in these two cases; this will reduce the depth of the strut spill from 2½ to 2 in. and the housing in of the diagonals to 1 in., and will increase the thickness of the strut spill to 6 inches. In practice the most suitable joint would soon be evolved.

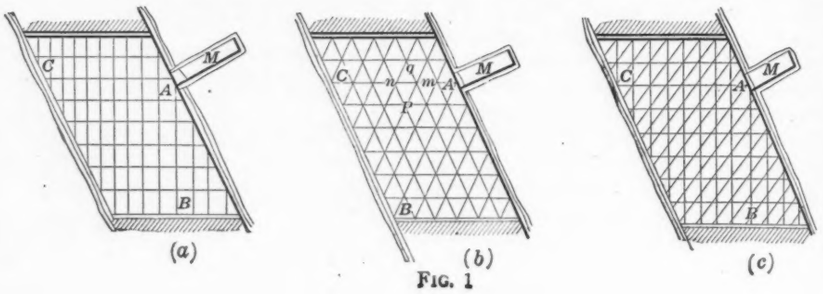

FIG. 1

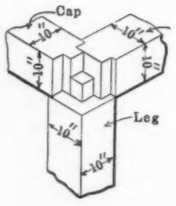

FIG. 2

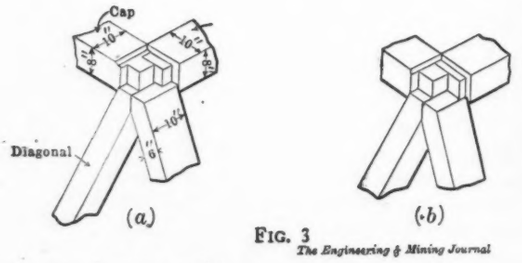

FIG. 3

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LOAD DIAGRAMS AND JOINTS OF SQUARE SETS

The drift set is shown in Fig. 5. Its form is arrived at by simply removing two of the diagonals and putting a 10x10-in. upright under each end of the cap and afterward lining with 10x10-in. timber the underside of the diagonals as shown; the outside of the drift being lagged with 10x4-in. timber. It may be pointed out here that the vertical load of filling on these 10x4-in. timbers will be less than half what it would be if they were flat.

On the drift cap and two legs the pressure is nearly all along the grain, though there is a bending moment on each of them, but in each case near the point of support. The crushing on the cap ends, however, is likely to be severe, and for this reason it would be preferable to have the cap of hard wood. It will be seen that any necessary repairing could be done without interrupting the traffic, and room also is left for further reinforcement of the sets if required. In putting in this drift set it would not be done all in one stage. Probably, in standing ground, the sill with the legs and cap (or internal set) would be put in first and the 10x4-in. lagging laid on the top for the time being. Later, the two diagonals would be added at the side and lagged with 10x4-in. timbers and, when the second floor of sets was being put in, the upper part of the drift set would be put in and lagged, and the lining with 10x10-in. timbers done when desired. In heavy ground a somewhat similar method would be adopted with driving laths, probably in the place of the temporary 10x4-in. timbers on the caps.

Framing at Pillars

In Fig. 6 is shown a way of putting in the sets, where the wall is vertical, or where a pillar is left. At every second floor, a half cap will be put in, its spill on the pillar end being a plain 5x5-in. spill to accommodate the top of a 10x5-in. or 10x4-in. upright, and 10x5-in. or 10x4-in. struts as shown (the function of these 10x5-in. timbers being mainly to keep the end of the cap up to its work). The 10x5-in. uprights will fit into the spill of the 10x8-in. struts above and below the half cap; all these joints being well blocked against the ground.

In the case of a pillar, the filling could then be done in the manner of the Broken Hill Proprietary mine, by laying, as the filling rises, 5x2-in. lagging (3 in. apart) horizontally with their ends

against these 10x4-in. uprights and, for residue filling, putting waste candle-box pieces and sawmill flitches to block the 3-in. openings. An advantage of the sets is that the chutes can be put in on the slope, or vertically, as desired.

For working the sets in the admirable method, used so extensively in the Broken Hill Proprietary mine, of hanging the sets from a boom and stoping underhand, there is to me no apparent difficulty. The difference would be that the sets would be carried down on a rill, and in running ground this would be rather an advantage. There would not be so much weight on the boom as in the case of vertical sets.

To arrive at the amount of timber used by the proposed set, I took a space 24 ft. high by 30 ft. by 30 ft. and calculated the amount of material required to timber it in the case of the 7x6x5-ft. square set, and the 8x6x6-ft. square set with 10x10-in. timber; and the proposed set with 7-ft. 6-inch caps, spaced 8-ft. centers vertically and 5-ft. center strutways, caps and struts of 10x8 in. and diagonals 10x6 in. with the result as shown in the table.

Comparison of Timbering Methods	Equivalent Length of 10x10-in. Timber Required	Amount Used in the Frames across the Lode	Percentage Used in the Cross Frames
Square set, 7x6x5-ft.	1850 ft.	1340 ft.	72½
Square set, 8x6x6-ft.	1500 ft.	1050 ft.	70
Proposed set....	1483 ft.	1200 ft.	81

It will be seen that, in comparison with the most favorable case for the square set (and making no allowance for diagonals, liners, etc., in the square-set case) the proposed set uses about 1 per cent. less timber, but has 14 per cent. more timber in its cross frames, where it is most required.

In conclusion, I admit the slight extra expense of cutting the timbers for the joint, and also foresee some slight difficulties in using the set, but these, I expect, can be easily overcome in practice. On the other hand I believe that the proposed modification may be said to have the following advantages: Far greater strength without more timber; greater stability under uneven pressure; filling will not be required in many cases; where filling is required, it can be done more cheaply, because the face can be carried forward much farther in advance of the older filling, and so the newer filling can be put in, in greater quantities at a time; it is stronger than the Deidesheimer set, which was admittedly stronger than the present set; it has a flexibility of application, as the angle of the diagonals can be varied to a certain extent; the joint is stronger than the present joint; a stronger drift set can be used with it; chutes can be put in more conveniently; it has a greater proportion of its timber in the frames across the lode, and the timbers are lighter to handle.

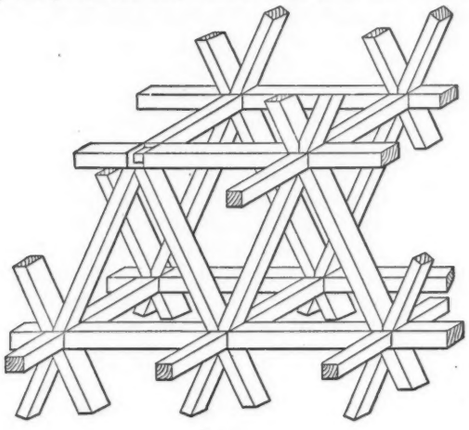

FIG. 4

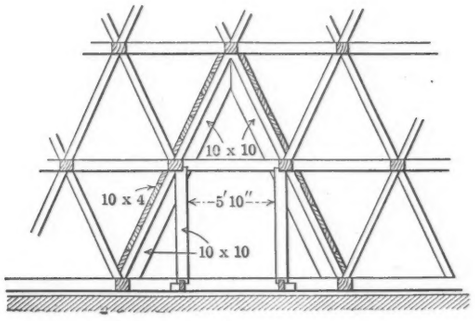

FIG. 5

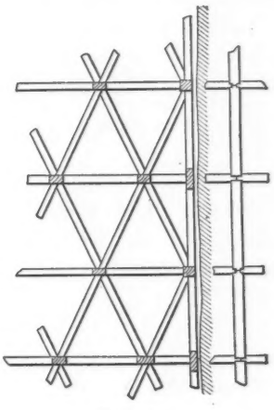

FIG. 6

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TRIANGULAR SETS FOR MINE TIMBERING

Michigan's Coal Resources

Michigan's coal production has decreased in each of the last two years, according to statistics collected by the U. S. Geological Survey and the Michigan Geological Survey, working in coöperation. The output in 1909 was 1,784,692 tons, about 3 per cent. less than that of 1908. In 1910 the production amounted to 1,534,967 tons, a decrease, compared with 1909, of 14 per cent. The value decreased from $3,199,351 to $2,930,771, a loss of 8.39 per cent.

Although the decrease in value was proportionately greater than the decrease in tonnage, the reasons assigned for the decrease in 1909 are applicable to 1910; that is, a development for several years preceding 1909 of coal properties in excess of the ability of the market to absorb the product. The decrease in 1910 was also partly attributable to labor troubles, for of the 3575 men employed 1663 were on strike from April 1 to June 1, and the average time lost for each man on strike was 52 days. The 3575 men employed in the coal mines in 1910 worked an average of 211 days.

According to Alfred C. Lane, formerly State geologist of Michigan, there are seven horizons at which the coal occurs in workable thickness. The coalfields are confined entirely to the lower peninsula. An area of approximately 11,000 square miles is covered by the coal-bearing formations, which lie almost in the exact center of the peninsula. This is the only known coalfield within the drainage area of the Great Lakes.

Michigan's original supply of coal, according to the estimate of M. R. Campbell, of the U. S. Geological Survey, was 12,000,000,000 tons. The production of the State at the close of 1910 amounted to 18,997,621 tons, which, including the waste involved in the mining operations, represented an exhaustion of 28,500,000 tons.

The coals of Michigan are, for the most part, of a lower grade than those coming from Ohio and Pennsylvania, with which they have to compete. All the Michigan coals are of the dry, noncoking bituminous variety. The coke manufactured in the State is made from coal brought from Ohio or Pennsylvania.

Texas Quicksilver Production

The production of quicksilver in Texas in 1910 from the Terlingua district, on the Mexican border, in Brewster county, was 3320 flasks, against 4188 flasks in 1909. The decrease, according to H. D. McCaskey, of the U. S. Geological Survey, was caused by the closing down of the Marfa and Mariposa mines in May. Of the total production of the United States, Texas furnished 16 per cent. in 1910, against 20 per cent. in 1909. The total production of quicksilver in Texas since 1899, when operations began, has been 44,844 flasks of 75 lb. each.

The production of German Southwest Africa from the time of discovery of diamonds, May, 1908, to the end of 1910, is given in "Bergwirtschaftliche Mitteilungen" as 1,399,101 carats.

Low Cost of Mining on Mother Lode

By William G. Devereux*

The operating costs at the Melones mine in Calaveras county, Cal., are the lowest yet attained on the Mother Lode. Cheap power, labor and supplies and a large orebody with strong walls make it possible to profitably work $2 ore.

*Manager, Melones Mining Company, Melones, Calaveras county, Cal.

There is probably no gold-mining district in the world of equal importance that offers such opportunities for the profitable treatment of low-grade ore as the Mother Lode of California, but it is advisable at the outset to enumerate briefly the main factors contributing to this condition; otherwise the following statements might easily lead to unjustifiable comparisons. On account of the mild climate and proximity to agricultural districts and large business centers, labor is cheap in comparison with its efficiency. The scale of wages in effect at present is: Mine and mill (8 hours actual work) machine men, timbermen, hoist engineers, concentrator and battery men, $3; chuck tenders, trammers, muckers and helpers of various sorts in both mine and mill, $2.50; outside labor (9½ hours actual work), from $4 for blacksmiths and carpenters to $2.50 for general labor.

Favorable Operating Conditions

The cost of supplies is moderate, as compared with most mining districts, and as they can be quickly delivered it is unnecessary to keep large stocks on hand. Timber has been unusually cheap, although recently the price has been advancing rapidly, but even now yellow-pine lumber can be bought for $16 to $20 per 1000 bd.ft., while round logs for mine timbers are slightly cheaper. For this reason, perhaps, there has been little attempt at mining the extremely heavy orebodies characteristic of Jackson and Angels Camp by other methods than with square sets; indeed it would be impossible to mine many of them in any other way. There are certain properties, especially among those of lower grade, in which strong walls with firm ore permit almost complete extraction without the use of any timber in the stopes. Taking everything into consideration, however, probably the most important factor in cheap operation is the low cost of power. Steam with oil as fuel is used to a great extent, but the large hydroelectric developments are the most economical sources of supply. These furnish power at 0.73 to 1c. per kilowatt-hour, depending on the load factor and the peak-load conditions. In many cases water powers are owned by individual mining companies, which, as a rule, produce power at considerably lower cost.

The Melones Mining Company belongs in the last class, and by virtue of favorable conditions and taking advantage of them, has been able to treat ore that has averaged only $2.13 since the beginning of operations eight years ago.

General Description of Property

The Mother Lode district has been too well described to require reiteration of other than its characteristics[1] at the particular place in question. The orebody worked by the Melones Mining Company outcrops on the summit of Carson hill in Calaveras county, about a mile west of and about 1200 ft. above the Stanislaus river. Jamestown is 10 miles to the southeast and Angels Camp 5 miles to the northwest. Between these two towns there is practically a continuous line of mines, many of which have been and some of which still are important producers. The main outcrop, known as the west vein, strikes northwesterly with an easterly dip, and is nearly continuous from Jamestown to Angels; it has been rich in spots between Jamestown and the Stanislaus river, but from there on it passes over Carson hill and on to Angels, a massive outcrop of almost barren white quartz. A branch known as the east vein, equally massive and barren, striking almost due east with a northerly dip, diverges sharply from the west vein just beyond the summit of Carson hill and continues out in the hanging wall for several thousand feet, while a third irregular series of outcrops, known as the middle vein, unites with the others to make a huge quartz bluff several hundred feet wide; this in turn resolves itself after a few hundred feet into two parallel veins which continue on to Angels Camp.

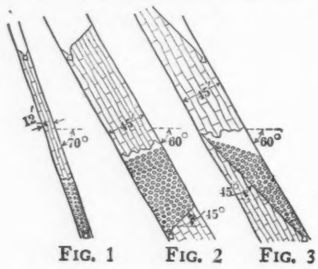

FIG. 1 FIG. 2 FIG. 3

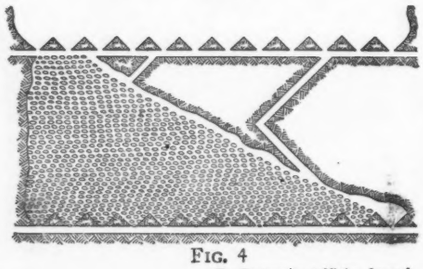

FIG. 4

The Engineering & Mining Journal

LONGITUDINAL AND CROSS-SECTIONS OF A STOPE

The country rock, a slaty mica-schist (the Calaveras formation of the Geological Survey), stands almost vertically on edge and its strike is parallel with that of the west vein, which has the main trend of the Mother Lode. It has been greatly shattered in the neighborhood of the east vein, which cuts across it at an acute angle. This shattered rock has been impregnated with quartz and iron pyrites carrying gold, the amount of which increases as the various veins converge to form the main orebody of the Melones company. While gold occurs on both sides of the east vein, which is locally called the Bull Ledge, and will hereafter be referred to by that name, the ore in the foot wall is much more extensive and work has been confined to it thus far.

Development

This orebody was worked in the early days by millholing and opencutting, and the best shoots for 1000 ft. along the strike and a width of 30 ft. or more were stoped out to the 280-ft. level, on which there was a tunnel. The property was in this condition when the present operations were started with the object of working a long and wide but low-grade deposit. The following plan of development was carried out under the supervision of W. B. Devereux, at that time consulting engineer for the company.

A shaft was sunk on the hanging wall of the ore (the foot wall of the Bull Ledge) at about the center of the shoot, and connected with a raise from a tunnel forming the 875 level. Meanwhile, a mill site was selected on the Stanislaus river, near the line of the Sierra railway, and a main adit driven on the 1100 level, which elevation allowed just sufficient hight to deliver the ore by gravity to the mill bins. This tunnel, which was driven large enough to accommodate a car with a 6x6-ft. cross-section, intersects the Bull Ledge at 4089 ft. and a large storage pocket with loading chutes was installed at 4600 ft. This was connected by a raise to the 875 level and thence up to the surface through the shaft, furnishing a continuous ore pass; levels have since been driven at 360, 450 and 590 ft. While development was being carried on in the mine, 60 of the 100 stamps had been completed in the mill and water power has been developed on the Stanislaus river

[1]U. S. Geol. Surv., Mother Lode District, California, *Folio* 63.

capable of furnishing 650 effective horsepower.

Shrinkage Stoping

Development work had shown that the best ore occurred along the Bull Ledge, which forms the hanging wall, and that the gold content of the ore gradually decreased toward the foot wall until the workable limit was reached at an average width of 40 ft. At the outset it was apparent that the grade of the ore would not permit the use of timbers, and the so called shrinkage method of stoping was decided upon. Generally speaking, the shrinkage method consists in running drifts on the various levels along the orebody, putting in chutes at intervals, and, after sufficient stoping has been done to afford headroom, allowing the broken ore to accumulate, merely drawing off enough to allow space for working, thus furnishing support for the walls until the block has been mined, at which time the broken ore may all be drawn and the stope allowed to cave. The stope may be entered through raises, either in the ore, in which case they are destroyed as the mining progresses, and access must always be from the top, or in the foot wall with short crosscuts at intervals to the stope.

It is essential to the success of mining in this manner that the vein dip not less than 60 deg.; that there be a good hanging wall, and that the ore itself be sufficiently firm so as not to cave without warning; in a word, to be safe when it looks safe. It is also important, although not essential, that the orebody be regular in shape, as it is difficult to widen a stope once it has been started, and almost impossible to follow bulges or irregularities. Pillars of low-grade ore may be left if the stope is large, although if narrow, they may cause the broken ore to jam. In any event, the sides should be brought up to a steep ridge on top to prevent broken rock lodging as the stope is drawn. However, little selection is possible and the method is not advisable for veins of irregular shape.

This general scheme is capable of a great many modifications governed by local conditions, which greatly affect the cost of mining and upon which may depend the success or failure of the operation; thus in a fairly narrow orebody, say 12 ft. wide with a steep dip of 70 deg. or more, it would make practically no difference whether the drift were run in the hanging wall, foot wall, or in the middle of the vein, as in any case the broken ore would feed readily to the chutes. In Figs. 1 and 4 these chutes are shown.

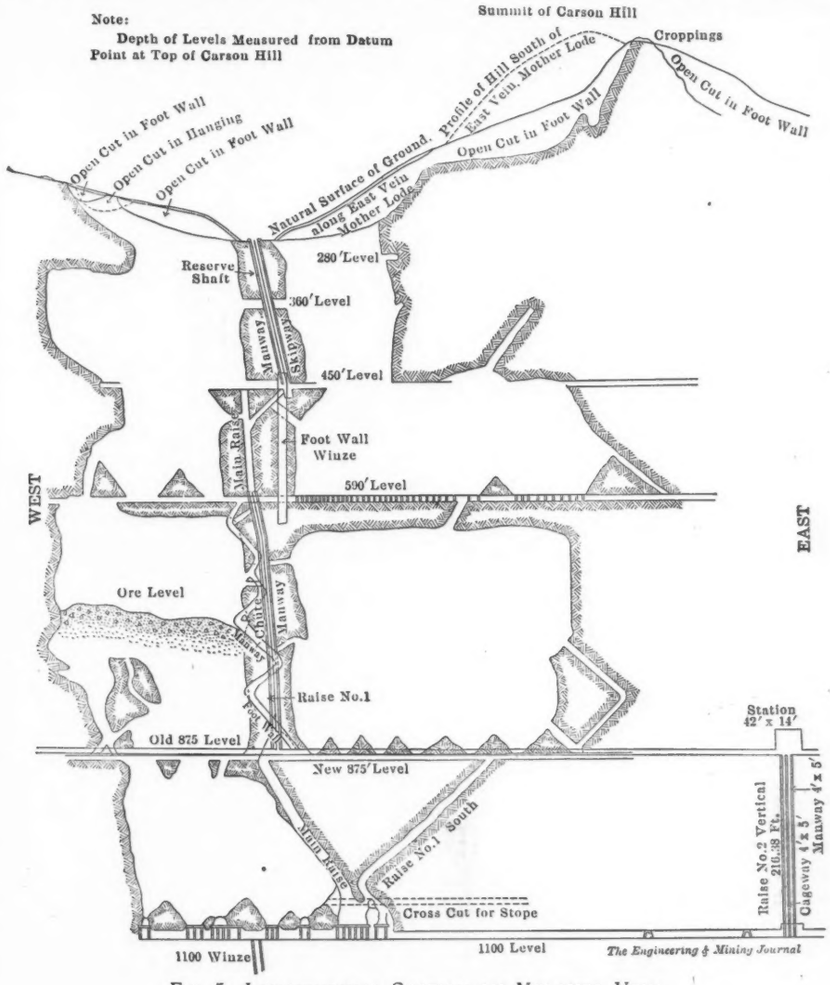

Fig. 5. Longitudinal Section on Melones Vein

However, as the dip flattens or the vein widens, or both, it becomes necessary to have the drift as far toward the foot wall as possible, and in the case of a wide vein, such as at Melones, which is hardly less than 30 ft. and attains a maximum width of 80 ft., it has been at times necessary to have the drift entirely in foot-wall rock. The reason for this, as shown in the accompanying illustrations, Figs. 2 and 3, is that when the chutes lie toward the hanging wall, the ore filling when being drawn has a tendency to stick on the foot wall and slope down toward the hanging, making it impossible to maintain the full width of the stope to any great hight without leaving a large portion of the hanging wall unsupported. This causes a dangerous situation and one which may possibly entail the loss of the stope itself if the hanging wall caves, which it is quite apt to do; and in any event leaves a large wedge-shaped block of ore in the foot wall above the level, which it is almost impossible to recover.

Opening Levels for Stoping

The details of opening a stope from a given level and the distance between levels is largely governed by the grade of the ore, although the latter point may be dependent on the dip of the vein. If the ore is very low grade, it is best to start raises from the drift 30 to 50 ft. apart, to branch out at 45-deg. angles, as soon as there is sufficient headroom above the timbers forming the chute, and eventually connect with each other, leaving pyramids of solid rock to guide the ore into the chute. The chutes should be large; at Melones they are 3x4 ft. with wooden-bar gates. If the ore is sufficiently rich to warrant the extra expense, the entire back of the drift may be taken down and the broken ore carried on timbers with the chutes at as close intervals as desired. However, as the pillars left between the chutes by the first method can usually all be recovered when finishing the stope from the next level below, it is doubtful if the timbering method is justified in any case, provided the ground will stand alone, and it has been entirely abandoned at Melones. Before stoping is started the block is developed by one or more raises to the next level above, which are run zigzag on 45-deg. inclines to avoid timbers and ladders, and are used later as manways. If the levels are far apart, it is sometimes advisable to carry up, for at least part of the distance, a cribbed manway in the broken ore, but in any event, one end of the stope is carried up a considerable distance ahead of the other, which leaves an outlet at the low end for some time. The stope should be in this condition,

that is, sloping up from one end, when breaking through and taking out the chute pillars from the stope above, as is shown in Fig. 4, an ideal longitudinal section.

Economical Limit of Stoping Hight

Returning to the question of distance between levels, the operation of opening the level and connecting the raises from the chutes costs about three times as much per ton as breaking the ore after the stope is fairly started. Thus it would seem that the further apart the levels, the cheaper the cost, and to a certain extent this is the case, but it must be remembered that about 60 per cent. of the ore mined must remain as filling until the stope is finished, and the most economical distance between levels is reached when the interest on the cost of mining the ore thus locked up equals the cost of opening a level. The size of the orebody bears on this point, in that the larger it is, the greater the tonnage per foot in hight. In spite of this, levels frequently have to be driven much closer together than the economical distance, owing to the necessity of finishing the stope quickly in order to satisfy the demand for ore, but the aim should be to avoid this situation and, once the mine is on a producing basis, the development work should be kept sufficiently far ahead to insure an adequate supply of ore from the stopes already finished, while others between properly spaced levels are being completed.

There are two levels in the Melones mine 285 ft. vertically apart between which the ore, averaging 35 ft. wide, has been successfully mined. The length of the orebody here was 600 ft., but it was divided into two stopes, 300 and 250 ft. long respectively, by the main shaft around which a pillar had to be left, as it is used as a chute for the ore from the upper levels to the main loading pocket on the 1100 level. Thus it was possible to finish one stope at a time, which resulted in low costs; but had the whole 600 ft. been stoped in one block, it would undoubtedly have been much cheaper to have run the levels closer together. In accordance with this idea a lower level, which will be mined in one stope for its entire length, is being driven with but 200 ft. of backs.

As the dip flattens to about 60 deg., the levels must be brought still closer together, as no matter how far toward the foot wall the chutes are placed trouble will be experienced in drawing the ore from along the foot wall in a stope that has any such hight as the above. With dips of less than 60 deg. the method is impractical except possibly in the case of an unusually smooth foot wall.

Both Piston and Hammer Drills Used

Stoping is performed with 3⅛-in. piston drills supplemented with small hammer drills for breaking the large boulders. Stoping hammer drills are used in cutting the preliminary raises, and when used with a long drill are most useful at the chutes to break large pieces of rock, which frequently choke the chutes some distance up, but they have not been found as efficient for stoping as the large piston machines owing to the slate and schist, which compose the orebody, leaving an irregular jagged back with long thin "fingers" hanging down, in which a flat hole across the grain will break much more than an upper following the stratification. The ore drills only moderately well for, although not hard as a rule, it is tough and contains many seams of hard quartz, which tends to "ficher" the hole, so that a large breakage per machine shift is only attained by taking advantage of the seams and slips.

Reference to the annual mine and mill record for 1909 and 1910, Table III, shows the various data that vitally affect the cost of mining: The tons stoped per machine-shift (two men, 8 hours); and the powder per ton (40 per cent. gelatin). The first item, which is by far the most important, varies from as low as eight tons, while the preliminary raises are being connected, to as high as 82 tons attained in December, 1909, in an opened stope. This figure, which is abnormal, was made possible by loose, caving ground and the average from start to finish is about 40 tons.

Ore Transportation and Milling

The ore on the upper levels is trammed from the chutes by hand in cars of one ton capacity to the main shaft, through which it falls into the 500-ton loading pocket on the 1100 level, previously referred to. In addition to this, there are several smaller loading pockets for the ore from the stopes on the 1100 level. From these pockets the ore is drawn into steel cars of 200 cu.ft. capacity and drawn in trains of 5 or 6 cars by an eight-ton electric locomotive with a drawbar pull of 2500 lb., to a 500-ton ore bin situated just above the mill, a distance of about one mile. The track is 36-in. gage, laid with 30-lb. rails and the power used is 500-v. direct current carried on a trolley of 00 copper wire. The grade of the tunnel is 3 in. in 100 ft., which requires about as much power to draw the empty train in as to pull a loaded one out. From the bin the ore is delivered in a three-ton car a distance of 100 ft. to the rock breakers, which method is about to be replaced by a belt-conveyer system.

Milling at Melones presents a rather different problem from the other mines of the district, in that the ore contains from 3 to 4 per cent. of low-grade sulphurets carrying about two-thirds of the gold, while only one-third is in free gold, almost an exact reversal of the usual proportions in Mother Lode mines. The mill, which is situated about 750 ft. from the mouth of the 1100 tunnel, on a steep hill, contains two No. 5 Gates gyratory rock breakers, one hundred 1000-lb. stamps, dropping 7 in., 104 times per minute, crushing through 20-mesh woven-wire screens, amalgamating plates, 24 Wilfley tables and 20 Frue van-

TABLE I. MELONES MINING COMPANY COSTS, OCT. 1, 1909 TO OCT. 1, 1910

Mined 2,000 Surface Tons 140,400 Stoped Milled 148,900 Tons	Pay Roll		Supplies		General Chgs.		Total	
	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton	Amount	Per Ton
Stoping	$ 27,763	$0.198	$14,935	$0.106	.....	.....	$ 42,698	$0.304
Developing	2,169	0.015	831	0.006	.....	.....	3,000	0.021
Surface	636	0.317	207	0.103	.....	.....	843	0.420
Tramming	14,446	0.097	5,849	0.039	.....	.....	20,295	0.136
Total mining	45,014	0.312	21,822	0.159	.....	.....	66,836	0.463
Ore transportation	5,836	0.039	1,320	0.009	.....	.....	7,156	0.048
Milling	27,325	0.183	12,192	0.082	.....	.....	39,517	0.265
Milling repairs	.....	.....	1,204	0.008	.....	.....	1,204	0.008
Power	2,649	0.018	373	0.002	.....	.....	3,021	0.020
Flume repairs	4,453	0.030	3,184	0.022	$ 60	.....	7,697	0.052
Stable	179	0.001	1,068	0.007	217	$0.001	1,463	0.009
Assaying	1,508	0.010	619	0.004	22	.....	2,148	0.014
Office and superintendence	11,640	0.078	324	0.002	.....	.....	11,963	0.080
Telephone	.....	.....	.....	.....	115	0.001	115	0.001
Insurance and taxes	.....	.....	.....	.....	5,511	0.037	5,511	0.037
Legal expense	.....	.....	.....	.....	600	0.004	600	0.004
General expense	.....	.....	.....	.....	258	0.002	259	0.002
Total general charges	20,428	0.137	5,566	0.039	6,782	0.045	32,777	0.219
Total mining, milling general charges	98,603	0.671	42,105	0.287	6,782	0.045	147,490	1.003
Concentrates, shipments	1,344	0.009	.....	.....	.....	.....	1,344	0.009
Total operation	99,947	0.680	42,105	0.287	6,782	0.045	148,894	1.012
1100 extension	2,863	0.019	1,699	0.012	.....	.....	4,562	0.031
Mine equipment	136	0.001	2,447	0.017	54	.....	2,637	0.018
Mine properties	36	.....	.....	.....	3	.....	39	.....
Power plant	540	0.004	993	0.007	10	.....	1,544	0.011
Dwellings	322	0.002	1,189	0.008	253	0.002	1,764	0.012
Total construction	3,897	0.026	6,329	0.044	320	0.002	10,546	0.072
Grand total	103,844	0.706	48,433	0.331	7,102	0.047	159,380	1.084

ners, besides various classifiers and pumps.

The pulp from the batteries flows over amalgamating plates thence to Wilfley tables that make four products: concentrates, first middlings, second middlings and tailings. The first middlings, taken from the first 12 in. back of the concentrates on each table, flow to two spitzkasten with three spigots in each, which discharge on six Wilfley tables. The middlings from these six tables are returned to the spitzkasten. The second middlings from the first set of tables flow to Frue vanners, which make a concentrate slightly lower in grade than the concentrate made by the Wilfley tables. The fine vanner concentrates and slimes are lower grade than the coarser concentrates made by the Wilfley tables. The tailings from the tables and vanners flow to waste.

The extraction is 86 to 88 per cent., which could undoubtedly be improved by regrinding the table middlings, but it is not considered that the amount recovered would pay for the extra operation.

Power Plant

Power is obtained from a hydraulic plant of 650 h.p., owned by the company, on the Stanislaus river, and consists of a timber crib dam 18 ft. high, 16,862 ft. of flume, 816 ft. of ditch, 758 ft. of tunnel, 982 ft. of redwood-stave pipe, delivering 125 sec.ft. of water, available for power under a head of 62 ft. The mill is driven direct from a 450-h.p. Victor Francis vertical turbine, transmitting power through a pair of bevel steel gears, mounted at the top of a 52-ft. vertical shaft. The water is led into the wheel pit in the redwood pipe, passing through a tunnel driven under the mill, which also serves as the tailrace for the waste water. The compressor, a two-stage machine having a capacity of 1200 cu.ft. of free air per minute, and a 100-kw. 500-v., d.c. generator, which furnishes power for the electrical locomotive and shop motors, are in a separate building and are belt driven by two 120-h.p. Knight tangential wheels, which can be connected with a clutch.

There is an auxiliary electric equipment taking current from a line of the Sierra & San Francisco Power Company, which, as it presents some novel features, will be briefly described. A 250-h.p. induction motor is belted to the Knight-wheel shaft as a countershaft at such ratio that it drives the compressor at its full working speed. During the dry season, there is not sufficient water available for the Knight wheels to run the compressor at full capacity, and at such times the motor is used to boost the wheels. The compressor is equipped with an automatic intake throttle or unloader and when it is unloading, the wheels tend to speed up, being relieved of their load, while the motor, being a constant-speed machine, resists this tendency, holding the wheels at practically constant speed, and in doing so becomes a generator and returns current to the line. The wheels are also controlled by a Lombard governor, as the motor would fail to exercise its braking function, should the line current be cut off, as sometimes happens, but ordinarily it furnishes perfect control and the governor has nothing to do. The safety of this arrangement lies in the fact that the full power of the wheels is less than that of the motor; consequently no load which the motor may be called upon to retard is capable of overloading it. This installation has proved an economical and elastic one to operate, and besides rendering the full utilization of the water possible, entails only such consumption of purchased electric power as is actually required; for at such times as the demand for compressed air is below the maximum the switch can be thrown out and the motor run idle, while the plant is driven by water power alone at as slow a speed as may be desired.

As the cost of power is such an important factor in operating, Table II is given showing the cost for water power since the present plant started operations. This cost includes extraordinary repairs, such as rebuilding 2000 ft. of flume and 300 ft. of redwood pipe, which was washed out some years ago by unusually heavy floods. The most economical feature is, that with the exception of the electric locomotive and a few small motors, all machinery is direct connected to waterwheels, which require no special attendance or care, and, therefore, the only important labor item chargeable to power is for flume maintenance.

This power development has no especial natural advantages, but consists approximately of four miles of river, falling 14 ft. per mile; but it differs from many mining plants in that instead of converting power into electricity and then distributing it with a 20 per cent. or more conversion and transmission loss, every effort was made to establish the operations at points where the machinery could be connected directly to the waterwheels.

TABLE II. MELONES MINING COMPANY POWER COSTS, 650 H.P.

	Cost for 7 Years	Cost per H.P. per Month
Operation and maintenance	$32,730.44	.....
Extraordinary repairs, rebuilding washedout flume and stave pipe	17,537.72	.....
Total Operation	$50,268.16	$0.92
Depreciation	$37,067.73	$0.68
Upkeep of wheels	5,459.42	0.10
Six per cent. interest on investment for 7 years	64,186.50	1.18
Total Cost	$156,981.81	$2.87

Operating Costs

The average costs since the beginning of operations have been somewhat in excess of those contained in the accompanying cost sheet, Table I, which is for the last fiscal year, and is a little higher than for the year previous; but the earlier years include the cost of mining about 200,000 tons of ore now broken and

TABLE III. MINE AND MILL RECORD, MELONES MINING COMPANY, OCT. 1, 1909, TO OCT. 1, 1910

	Ore Mined*				Milling											
										Actual Recovery						
	Tons	$ Assay	Tons per Machine-shift	Pounds Powder per Ton Ore	Tons	Heads $	Tails c.	Per Cent. Theoretical Extraction	Gross Value of Ore Milled	Concentrates	Amalgam	Total	Per Cent. Actual Extraction	Average Number Stamps Dropping	Tons per Stamp
Oct.	6,500	2.86	56	...	11,200	2.03	30	85	$22,736	$10,284	$6,953	$17,237	76	85	4.2
Nov.	10,000	2.26	52	...	12,000	1.80	27	85	21,600	11,484	8,006	19,490	90	97	4.1
Dec.	13,000	2.22	66	...	12,800	1.75	27	85	21,460	11,986	7,871	19,858	92	96	4.3
Jan.	15,000	2.17	43	0.9	13,500	1.74	24	86	23,490	14,946	7,179	22,125	94	100	4.36
Feb.	12,500	2.38	32	1.2	13,700	1.78	26	85	24,386	14,937	7,356	22,294	91	100	4.89
March.	19,000	2.34	43	0.9	14,200	1.86	26	86	26,412	15,674	8,991	24,665	93	100	4.58
April.	16,400	2.21	38	1.2	13,000	2.27	32	86	29,599	15,536	9,902	25,439	86	100	4.33
May	16,500	3.24	38	1.3	13,600	2.13	26	87	28,968	16,760	8,845	25,605	88	100	4.53
June.	9,000	1.78	38	...	13,500	1.90	29	85	24,898	13,894	8,089	21,983	85	100	4.36
July	5,000	2.36	26	...	9,100	2.44	30	88	22,204	11,669	7,745	19,414	88	73	4.00
Aug.	7,500	2.74	32	1.4	10,900	2.27	32	86	24,743	12,105	6,908	19,014	77	76	4.63
Sept.	12,000	3.46	39	1.2	11,400	2.06	29	86	23,484	13,123	8,358	21,482	91	82	4.63
Total	142,400	2.53†	40	1.2	148,900	1.98	28	86	$293,980	$162,402	$96,210	$258,612	88	92	4.41

*Sixty per cent. of the broken ore left in the stopes until block is mined. †Average of ore mined, not milled, for one year.

stored in the stopes, adding 40 stamps to the mill, and buying a new compressor, so that the costs for the last two fiscal years, which were $1.07 and $1.084, can be taken as a fair example of what may be expected with operations fairly under way.

No depreciation is charged, but no suspense or capital accounts are kept and all construction, improvements and renewals, which have been liberal, in fact, all expenditures of any kind are charged to operation, and the total of the cost sheet balances with the books. Owing to the proximity to markets only a small amount of supplies is kept on hand, and their cost is immediately distributed to the proper accounts. The costs are for the production of gold bullion and concentrates, for as these products are sold for a net price the expense of marketing them does not properly belong on the cost sheet, which represents the cost of making the final products and is kept chiefly for the purpose of determining the efficiency of this operation. The total average costs per ton for the seven years that the property has been producing are: Costs, as per cost sheet, $1.267; marketing products, $0.315; tailing loss, $0.32; total costs and losses, $1.902; assay value of the ore, $2.13. The costs for the year 1909-1910 were: Costs, as per cost sheet, $1.084; marketing products, $0.361; tailing loss, $0.28; total cost and losses, $1.725; assay value of the ore, $1.98. The actual profit has been $0.213 for the period under consideration. The average number of men employed is 100 and as 440 tons of ore are treated per day, the average per man is 4.4 tons.

It is apparent from the foregoing that the factors in favor of cheap operation are: Cheap power, moderately cheap labor and supplies, and a large persistent and well defined orebody with strong hanging wall, which has little tendency to cave, and in which large tonnages can be blocked out with a minimum of development, while the unfavorable conditions are the low percentage of free gold and the large quantity of low-grade concentrates, while operations have at times been materially hindered by heavy floods in the winter and shortages of water in the summer.

Nomenclature of Iron and Steel

By Henry M. Howe *

Technical writers need a clear classification, but radical changes in present usage would be objectionable to iron trade. The term "blister bar" suggested and defined.

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In my previous article on this subject[1], I proposed ratifying the dominant definition of steel, which restricts it to initially malleable cast products, and providing for "blister steel" by removing it from the class "steel" and giving it a new name such as "blister" or some better one. Such a better one, "blister bar," has been proposed by a correspondent, better because it is already in wide use.

Of course, I recognized the objection to removing blister steel from the class "steel"; that any such change would be stoutly resisted by the makers of this product, who are among the most conservative of iron manufacturers. On further consideration a way of turning this difficulty suggests itself, based on a fundamental consideration too often overlooked. That is that there are really two distinct parties in interest, with diametrically opposed interests.

First, there are those actually engaged in iron manufacture or the iron trade. Both they, themselves, and those with whom they talk and correspond on iron matters, are so perfectly familiar with the existing classification that they are not troubled by its inconsistencies, and indeed are hardly aware of them. Hence they would not really be helped by any improvement of our classification, but they would be troubled by the change which any improvement would necessitate, and the more troubled because they have to use this nomenclature so constantly. Their immediate interests are opposed to any improvement.

Systematic Classification Desired by Writers

Second, there is the rest of mankind, and especially those who have to convey ideas about iron to others who are not thoroughly familiar with the existing classification. Included among these are writers on technical matters, both in the proceedings of our scientific and technical societies and elsewhere. To them the inconsistencies of our present classification are something of a stumbling block, because the classification itself is not perfectly familiar to the larger public which they address. Hence these inconsistencies increase their labor in conveying their ideas to their readers or hearers, and hence an improvement in our classification would be welcome to them. Yet the change which it would imply would not, as a change, trouble them appreciably, because they have not become wonted and wedded to the existing nomenclature by incessant use every day and hour as the iron maker has.

The more they write, and the more their writings become of value through the proceedings of technical societies, the more do their mental habits and attitude lead them to desire a consistent and systematic classification, to value consistency for itself, and to dislike those inconsistencies which are a matter of complete indifference to the first of our two classes, the makers and traders in iron.

To change the language of trade and manufacture would be next to impossible. For that matter, even if the iron trade could be brought to adopting a systematic classification, there are those who, if they could commend their product to their customers the better by departing from that classification would not hesitate to do so, and such a departure could not be punished or corrected by any tribunal.

Trade Objects to Changes in Nomenclature

On this account any attempt at improvement in nomenclature should be so planned that the improved nomenclature, though it would not be adopted by the iron trade, yet when adopted by technical writers would not be misunderstood by the iron trade. These principles should be clearly before us when we attempt any improvement in nomenclature.

First, it should be for the benefit of technical writers, and should be of real use to them by giving clearness, precision, and unequivocalness, and by helping to make the classification consistent and systematic. Second, though it would not be adopted by the trade, yet it must be inoffensive and unequivocal to that trade. In other words, it must help technical writers through making their language more consistent and systematic; yet it must also be clear and unequivocal to the trade which does not itself use it, but may wish to read the writings of those who do use it.

Let an example explain my meaning, viz., the following modification of certain of the definitions which I presented earlier.

"*Steel,* iron which is cast from the molten state into a mass which is usefully malleable initially at least in some one range of temperature. This is the definition recommended for use by technical writers.

"*Blister bar,* highly carburized iron made by the prolonged cementation of wrought iron or steel with carbonaceous matter. In trade this is habitually called 'blister steel.' The names blister bar

[1]Eng. and Min. Journ., Feb. 11, 1911, p. 327.

and blister steel are in trade strictly confined to the exceedingly pure product made by the cementation of wrought iron of extreme freedom from phosphorus and sulphur. It is recommended that technical writers avoid the term 'blister steel,' and instead write 'blister bar.'"

The trade actually uses "steel" both according to the recommended definition and as including blister bar, so that in trade parlance there are two kinds of steel which have absolutely nothing in common, the low-carbon steels of the first paragraph lacking the hardening power which makes blister steel "steel," and blister steel lacking the relative freedom from slag which make those low-carbon steels "steel." The existence of this anomaly is of no moment to the trade; yet it is a matter of concern to technical writers, because it is unsystematic and inconsistent.

But, if the definition of steel stands as I have given it here, both parties should be satisfied. The trade should be satisfied because its actual usage is stated clearily.

The technical writer should be satisfied because the amendment, in avoiding the inconsistency now existing, helps to make his classification systematic.

The second paragraph in the same way should be acceptable to both parties. The trade insists that when it says "blister bar" or "blister steel," it refers strictly and solely to that made by cementing pure Swedish wrought iron. But it seems to the rest of mankind unreasonable to exclude from this class other wrought iron and steel when so carburized. The trade says that to admit that impure wrought iron or bessemer steel when so carburized is "blister steel" would open the door to fraud. The writers reply that it would do so only as admitting that a blind or lame horse is still a horse would open the door to fraud in the horse trade, and that nobody in his senses would advocate changing the definition of the word "horse" in the dictionaries so that it would exclude blind, lame, and otherwise defective horses. Nevertheless, if the trade wishes an explanatory note added to the definition of "blister bar," setting forth the strict specific sense in which it uses that expression, that wish may well be complied with.

Satisfy Trade and Writers by Clear Classification

The wise procedure, therefore, would seem to be to prepare a systematic and consistent classification which is to be recommended for use in technical and scientific writings, but in doing this to make no attempt to alter existing trade usage, but, on the contrary, to shape all amendments in such a way that those who use the amended classification shall not be misunderstood by the trade. Further, to add to the several definitions such explanations and additions as may be needed to set forth clearly and fully the existing trade usage; in other words, to set up an amended, systematic, and consistent nomenclature and recommend it for use in the technical and scientific writings, yet to explain at the same time current trade usage.

The task is not so different from that which every writer of a dictionary has before him. He, too, must set forth not only the strict good usage, but also colloquialisms, so that both the precise and the loose may profit by his work. He may well explain that though the scientific exclude the whale from the class "fish," yet whales are commonly thought of and colloquially spoken of as fishes. Let us not attempt the task of Procrustes, and try to fit everything to our individual way of thinking. Rather let us recognize that there are various interests and points of view, and strive to serve all truly and impartially.

The Electric Weigher

By E. H. Messiter*

A method of weighing conveyed material by the production of an electromotive force proportional to the speed of the weighed stream, and a variation in conductivity of the circuit proportional to the mass of the stream.

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In most industrial establishments where material is handled in bulk, the conveyer is rapidly superseding other methods of transportation. This has created the necessity for a new method of weighing at least as accurate as the scales used with the older methods of handling in barrows, cars, or other receptacles. The design of the electric weigher is the direct outcome of this necessity.

Principles of the Electric Weigher

While material is in motion on a conveyer, the former method of leisurely direct comparison of its weight with standard weights is impracticable, and interruption of its motion for the purpose of weighing is distinctly disadvantageous. In order to weigh a continuous stream of material in motion, it is necessary to take into account the instantaneous weight of a definite part of the length of the stream and the speed at which that part of the stream is moving. While the problem was being studied with a view to adopting old methods of weighing and old methods of integrating to the new conditions, it was one which presented many serious difficulties. At a certain point, however, the idea of utilizing electricity was hit upon and the difficulties soon vanished.

The measurement of electrical quantity has been brought to a degree of precision not excelled by that attained in any other field. Ohm's law says that the quantity of electricity which flows in any circuit in a given time is proportional to the product of the electromotive force, or voltage, and the conductivity of the circuit. As soon as the problem of weighing a moving stream began to be studied, it was seen that the total weight passing a point in a unit of time is proportional to the product of the average weight of a unit of length of the stream and the speed of motion.

This led to the thought that if an electromotive force could be produced proportional to the speed of the stream and the conductivity of a circuit be made to vary with the weight of a part of the stream, or *vice versa*, the quantity of electricity which would flow in a given time would be truly proportional to the weight of material discharged by the stream in the same time.

Thanks to the wonderful progress already made in electricity, this can be done with an accuracy that leaves nothing to be desired.

It will be seen, therefore, that the electric weigher must consist of three elements, one corresponding to each of the three terms in Ohm's law. The first, to produce the electromotive force, is a dynamo; the second, to vary the conductivity of the circuit, is a rheostat; and the third, to measure the current, is a meter.

Constant-field Dynamo

The dynamo is subject to the rigorous law that the e.m.f. produced is proportional to the strength of the field and the number of conductors cutting across it per second. With a constant field and constant number of conductors in the armature the e.m.f. is directly proportional to the speed. The field is made constant by the use of permanent magnets. The demand for accurate electrical-measuring instruments has resulted in the development of special steels for permanent magnets and special methods of "ageing" after magnetization, so that it

is now possible to procure magnets which, when properly mounted, show no deterioration whatever over indefinite periods of time. The rest of the dynamo, or magneto, consists of the usual parts, pole pieces, armature, commutator and brushes. The design of the dynamo and the range of current used are such that armature reaction is not allowed to enter as a disturbing factor; and multiple brushes of a highly perfected material developed in Europe, maintain indefinitely a perfect condition of the commutator, and bring the brush resistance under absolute control.

The Rheostat

The second element, the rheostat, is controlled by scale beams of the usual lever and knife-edge type. Leaving for the moment the important question of the proper suspension of the conveyer, the construction of the rheostat will be described. The counterpoise of the scale is a cylindrical plunger, which is partly floated in mercury. With every change in the weight on the conveyer the plunger instantly adjusts itself to a new position, thereby at the same time changing the level of the mercury.

The rheostat proper consists of a large number of loops of wire placed in narrow vertical spaces at the two sides of the weigher. Each loop is connected to a platinum-tipped contact point on the inside of the mercury vessel. The current from the dynamo is led into the lower part of the mercury and leaves it by way of the highest contact point, which is below the surface of the mercury. In this way different portions of the total resistance are short-circuited in accordance with the weight.

The plunger constitutes a self-adjusting counterpoise, which operates frictionlessly. The mercury vessel is also a dash pot which quells all vibration. The upper part of the vessel is widened out to form a reservoir, which is partly filled with oil. This protects the mercury from the air and forms a trap to catch any fine dust which may get past the other safeguards mentioned below.

The Recording Mechanism

The meter is a form of ampere-hour meter, which has been used for years. It has a single rotating member floated in mercury and revolving in proportion to the flow of current. Friction and wear are eliminated, so that no change can be detected in the meter after years of use.

The method of calibrating the weigher is such, that it is only necessary to have a meter which will always go at the same speed when conveying a given current. This meter fulfils this requirement absolutely. The dial of the meter is, of course, graduated to read in units of weight.

The variation in the specific gravity of mercury, due to changes in temperature, is compensated for by making the mercury vessel of an insulating material whose coefficient of expansion just offsets that of the mercury. To illustrate the importance of this it may be noted that the difference between the expansion of iron and of mercury would cause a difference of 1 per cent. in the recorded weight between winter and summer, if plunger and mercury vessel were made of iron.

The conductivity of most conductors of electricity, of course, varies with temperature, increasing in some materials while decreasing in others. Effective means for balancing these variations have long been in use, and in the electric weigher the materials are so chosen that the meter has the same rate for a given weight and dynamo speed regardless of the temperature.

In connection with the above, the calibration of the weigher will explain its remarkable accuracy. Each resistance loop is provided with an adjusting rider astride of its two wires. The rider short-circuits the part of the loop beyond it. By moving the rider, an extremely fine adjustment of the resistance of the loop is made. Standard weights are suspended from the scale and the dynamo is run at a known speed and each loop is adjusted until the meter is exactly correct for the corresponding weight. The riders are then soldered permanently in position and the weigher is ready for service.

Empty Belt Tares the Loaded Portion

The method of suspending the conveyer is, as pointed out above, a matter of paramount importance. This is because the weight of the empty belt, which is the tare, is not constant. Wear, moisture and sticky material cause continual changes. To provide for this, a corresponding length of the unloaded part of the conveyer is suspended from the scale on the opposite side of the fulcrum from the loaded part, so that its weight acts counter to the weight of the loaded part. In this way the tare weight is automatically deducted and the scale is self-balancing.

There is often much dust in the air in the neighborhood of conveyers and the protection of the weigher from it has received considerable thought. The dynamo itself is tightly inclosed, and is further protected by a tight casing which surrounds it and the gears through which power is transmitted to it from the conveyer. The meter is hermetically sealed and the only other thing requiring protection is the mercury.

Dust Protection of Delicate Parts

Looked at from above, the two vertical spaces containing the wire loops and the transverse space containing the mercury vessel form a U-shaped chamber. Except for the narrow clearance around the plunger where it passes through the top, this chamber is tightly closed. The heat generated in the resistance wires is utilized to create an upward flow of air through the chamber. The air is admitted at the bottom through a double cotton filter, and must all escape through the narrow clearance around the plunger. The relatively high upward velocity here prevents the descent of dust, which may get past the double roof above. In addition to this the trap formed by the oil reservoir with its depressed bottom for sediment, is expected to protect the mercury surface for years under the worst conditions.

The electrical system lends itself readily to the attachment of distant indicating and recording instruments of the utmost value, without complication. By simply running two small wires from the totalizing instrument, referred to above as the meter, instruments may be placed in the office of the superintendent or elsewhere, which give a complete record of the tonnage carried by the conveyers. They also show immediately any slowing down or interruption in the feed and make a record of such interruptions, giving the exact time at which they occurred. These distant instruments are operated by an auxiliary circuit from a battery or other source.

Importance of Weight Returns

Experience has shown that means for instantly detecting variations in any part of a process and of recording them, have a far-reaching, beneficial effect on the capacity and efficiency of plants. This is true enough when applied in the form of pressure gages and the like to subsidiary processes, but is more especially true when applied to the movement of the material itself that the plant is built to handle. Not only should the movement of incoming and outgoing material be watched every minute of the day, but the amount of material transferred in course of treatment from one process to another, or into and out of storage, should be known from hour to hour. Samples, analyses and assays acquire a new value when the tonnage to which they apply is always accurately known.

In general, the weigher will serve the purpose much better than railroad scales, because it does not interrupt the movement of the material, saves switch-engine service and requires no attention other than to read the dial. The electric weigher is manufactured by the Electric Weighing Company, 180 Thirteenth avenue, New York.

The Japanese Bureau of Statistics has recently published the official figures for the 1908 mineral production. These show, exclusive of the island of Taiwan, a production of 107,482 oz. of gold; 3,866,589 oz. of silver; 89,624,319 lb. copper, and 14,672,828 metric tons of coal.

Modern Mine Power Plant—II

By Guy C. Stoltz *
and Samuel Shapira †

At Witherbee-Sherman's central plant, a turbine develops 750 kw. on the exhaust from a compound Nordberg engine. Electricity introduces saving of 3c. per ton at one mine.

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Witherbee, Sherman & Co.'s central electric-power plant is situated in the western part of Mineville, N. Y., and its power, together with that generated at the Port Henry plant, described in a previous article, and that of two hydroelectric stations nearby, is used to operate the magnetite mines of the neighborhood. The building is of red brick with steel trusses and corrugated-iron roof. The main structure is rectangular, 96x55 ft. and 30 ft. high, with an additional boiler-room extension 30x55 ft. All the floors are of concrete and the building is practically fireproof. A concrete transformer house, 28x18 ft., joins the power house. The engine-room floor is 14 ft. above the boiler-room floor and 9 ft. above the engine-room basement.

Boiler Equipment

The boiler room is 45x81 ft. and contains three Geary water-tube boilers and one Babcock & Wilcox boiler. Each Geary boiler is rated at 250 h.p. and contains one hundred and sixty 3½-in. tubes 14 ft. long, with water drums 42 in. by 18 ft. The grate surface of each boiler is 55 sq.ft. The Babcock & Wilcox boiler is rated at 400 h.p. and has 4000 sq.ft. of heating surface which consists of three steam and water drums, 36 in. by 23⅓ ft., placed above and connected to a set of 21 sections of tubes, each section consisting of nine 4-in. tubes 18 ft. long. The grate surface of this boiler is 90 sq.ft. Each of these four sets of boilers is provided with McClave sectional, top-shaking grates, fitted with twin levers for divided cutoff movement. The boilers are also provided with Wing turbine blowers for forced draft. The Babcock & Wilcox boiler is equipped with two 20-in. blowers, and the Geary boilers each have one 20-in. blower, all side installed. A Davis regulator is used in connection with the Wing blowers. These blowers and the regulator were described in detail in an earlier article relating to the Port Henry power plant.

The feed water for the boilers is supplied by a 10x6x10-in. Knowles pump of the outside-packed, plunger type. A second feed-water pump is held in reserve, a 10x6x12-in. Dean, outside-packed, plunger type. These pumps are placed one at each end of the boiler room. Boiler water is obtained from a pond fed by Dalton reservoir, 3 miles north of Mineville. The feed water is heated by a Cochrane, open-type, feed-water heater, placed directly back of the boilers. Two pumps supply water to the Cochrane heater. One is a Knowles 7x5-in. and the other is an Alberger 2½-in. volute pump, run by a 5-h.p. motor, and taking water from the condenser in the sub-engine room.

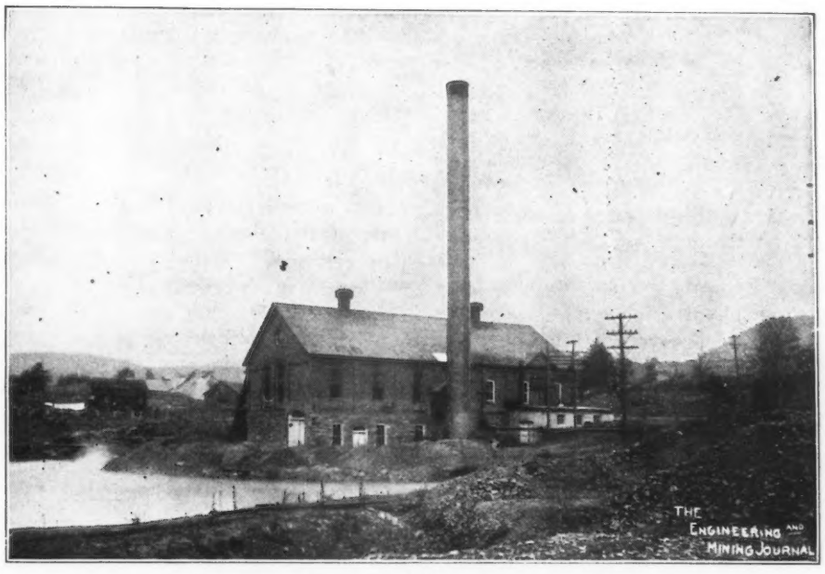
Saturated steam is led from the boilers through 8-in. extra-heavy U-pipes to the steam chests of the Nordberg corliss engine. A 6-in. extra-heavy pipe line extends to the steam chest of the low-pressure turbine. All saturated-steam pipe lines are covered with asbestos fire-felt covering of standard thickness.

Smoke goes to the stack through a 5½x7-ft. steel breeching. The unlined steel stack, which is outside the building, is 7 ft. in diameter and 110 ft. high, is self-supporting and rests upon a solid-concrete foundation 17x17 ft. and 9 ft. high.

The boilers are hand fired with No. 2 buckwheat anthracite coal, which is delivered to the boiler room by an overhead track, supported by concrete posts, 8 ft. above the boiler-room floor. Coal is received from the Lake Champlain & Moriah Railroad over a timber trestle 348 ft. long, which has an open concrete storage bin of 2500 tons capacity underneath. Ashes are delivered by the McClave-Brooks system of scrapers to an outside pit where they are loaded by bucket elevator to a concrete storage bin. From the bin the ashes are drawn off in wagons and used for road building.

Turbine Generating Equipment

The engine room is 44½x52 ft. and all the engine auxiliaries, except the exciter and switchboard, are placed below the engine-room floor. The generating apparatus consists of a Nordberg, horizontal, cross-compound, condensing engine with cylinders 23 and 46 in. and 48-in. stroke, and a horizontal, mixed-pressure turbine. The Nordberg engine develops 1000 h.p. at 150 lb. pressure and 100 r.p.m. It is direct connected to a flywheel alternator rated A.T.B. 32, 750 kw., 94 r.p.m., 3300 volts. An exciter is belted to the alternator shaft.



Witherbee-Sherman's New Power Plant

The low-pressure turbine is of the horizontal Curtis type, designed to run condensing. This turbine is rated A.T.B. 2, 750 kw., 1500 r.p.m., 3300 volts. It is run on the exhaust steam from the Nordberg engine; that is, the engine is run at high pressure, exhausting through an oil and water separator directly into the turbine. The turbine is provided with a set of valves so connected to the governor that when the exhaust steam from the engine is not sufficient to carry the load, these valves are opened, admitting high-pressure steam direct from the boilers. These valves are controlled by the same governor that controls the admission of low-pressure steam, and are similarly equipped with throttle valves, automatic emergency stop and screen.

When operated at full rated load (750 kw.) with not more than 2 in. absolute back pressure in the exhaust chamber of the turbine, and with a gage pressure of 150 lb. at the throttle, the consumption of dry steam does not exceed 26.5 lb. per kilowatt-hour. The turbine develops 520 kw. on the exhaust steam from the engine, when the latter is running noncondensing with a load of 650 kw., giving an output from the combined units of 1170 kw., at a water rate of 18.05 lb. per kilowatt-hour at the switchboard.

If necessary, the output of the two units can be increased to 1500 kw. by admitting some additional high-pressure steam into the turbine. In case of accident to the engine, it can be shut down and the turbine will then carry 750 kw. on live steam, with a consumption of 26.5 lb. per kilowatt-hour, which is approximately the same as the steam consumption of the Nordberg engine. Under ordinary conditions, however, the turbine operates on the exhaust steam alone from the engine. The exciter used in connection with the turbine consists of a form K induction motor, rated I 4, 50 h.p., 750 r.p.m., 3300 volts, and a generator rated DLC 6, 35 kw., 750 r.p.m., 175 volts. An equalizer rheostat is used between the field of this exciter and the exciter used with the engine-driven alternator.

The Curtis low-pressure turbine rests upon a reinforced-concrete platform 18x8x1 ft., which is supported by six reinforced-concrete columns 12 in. square and 13 ft. high. The reinforcement for the platform consists of 10-in. I-beams and 8-in. channels. The reinforcement for each column consists of six strands of 1½-in. wire rope. The space beneath the platform is used for the turbine auxiliaries. These consist of an Alberger condenser, having a condensing surface of 4500 sq.ft.; an Alberger 8x20x12-in. dry-vacuum pump; and an Alberger 12-in. standard volute pump having a 14-in. suction. The condensed steam is delivered by an Alberger 2½-in. volute pump to the feed-water heater in the boiler room.

Hydroelectric Power Stations

The two plants here described are owned by D. F. Payne, of Wadham Mills, N. Y., and furnish power for the operation of adjoining magnetite mines. The Kingdom plant is operated by the flow in Beaver brook, which has its source at Lincoln pond, six miles from Mineville, at 1150 ft. elevation. The pond is supplied by springs, but principally by the drainage of approximately 17 square miles of mountainous country.

The power house, a wooden structure, is situated one mile from the pond. A concrete dam above the plant delivers the water under a head of 316 ft. through a 32-in. steel penstock to a Pelton wheel running at 500 r.p.m. The waterwheel is direct connected to a 375-kw., 6600-volt alternator. An 11-kw., 125-volt exciter is belted to a pulley on the main-generator shaft.

The power is transmitted at 6600 volts seven miles to the central plant at Mineville, where three single-phase, oil-cooled transformers step the voltage down to 3300.

The Wadhams plant is situated on the Black river, six miles east of the Kingdom plant. The overflow from Kingdom dam and the discharge from the Pelton wheel, together with the natural drainage running to the river, are stored at this plant by a concrete dam. The power house is equipped with a 300-kw., 6600-volt alternator, belt connected to a turbine, operating under a 48-ft. head. The penstock from the dam is 54 in. diameter and 350 ft. long. Excitation for the generator is provided by a 7½-kw. generator belted to the main shaft.

The current at 6600 volts is transmitted nine miles to Cook shaft station at the Smith mine, two miles north of Mineville proper. Here the voltage is stepped down to 3300 by oil-cooled transformers connected in delta. From the transformers the power is delivered to the central plant at Mineville.

Power Distribution

The transmission lines from the Port Henry plant (described in a previous article) carrying 2300 kw. at 6600 volts; the lines from the central plant, carrying 2175 kw. at 3300 volts; and the 675 kw. from the two hydroelectric plants, have their busbars so connected at the A & B distributing station that any one of the plants may be operated on any of the feeder lines, or again, they may all be run in parallel, the voltage being maintained by means of a regulator on each generator.

At the main distribution station the lines are connected through automatic overload oil switches to the 3300-volt distributing busbars of an 11-panel switchboard, of which there are two panels for 402-h.p. synchronous motors driving two 2500-cu.ft. compressors; two for 200-h.p. motors driving two 1200-cu.ft. compressors; two for the lighting of Witherbee and Mineville; one panel for a 12-h.p. motor driving one vertical triplex pump in A shaft; one for a 30-h.p. motor driving one horizontal triplex pump in B shaft; one for a 300-h.p. motor driving a Wellman-Seaver-Morgan four-drum hoist; one for motor drives at concentrating mill No. 1; and one for motor drives at concentrating mill No. 3. All power from the switchboard at the main station is delivered at 440 volts, except to the lines for the synchronous motors, and those for mills Nos. 1 and 3, which receive power at 3300 volts. At the mills the current is stepped down to 440 volts.

One of the synchronous motors is belt connected to a 2500-cu.ft. Nordberg 30x44x48-in., two-stage, air compressor. The second motor drives, in like manner, an Ingersoll-Rand, two-stage compressor, 18¼x30¼x27 in. The synchronous motors have recently replaced the induction type in order to realize a higher power factor and to obtain better regulation. These motors are operated with an input of 360 k.v.a. and 80 per cent. leading power factor. Both motors are rated at 400 h.p. at 3300 volts, and are excited by direct-connected exciters. They are started as induction motors at 1650 volts, and when the speed is near synchronism, they are connected directly to the 3300-volt lines.

Two 1200-cu.ft. Ingersoll-Rand 16¼x18¼x25-in., two-stage compressors are belt connected to two 200-h.p., 440-volt induction motors. A Wellman-Seaver-Morgan, four-drum geared hoist for A and B shafts of the Harmony mines is driven by a 300-h.p. induction motor. Three oil-cooled, single-phase transformers are provided for the smaller compressors, three-phase, oil-cooled for the pumps, and one three-phase, air-cooled for the hoisting equipment.

Transmission System

The main transmission lines leading from the central plant to A & B distribution station are tapped by sublines which lead to mill No. 2, where the 3300-volt current is transformed to 440 volts and distributed through a three-panel switchboard to the various motor drives. A second set of branch lines carries power to the Joker & Bonanza hoisting house, delivering it to busbars from which it is distributed to the several transformers through a panel switchboard and thence to a two-drum hoist geared to a 500-h.p. induction motor, and also to a 1200-cu.ft., class J, Ingersoll-Rand compressor, belt driven by a 200-h.p. induction motor. A third set to sublines carries 3300 volts to Barton Hill mines, through transformers reducing 3300 to 400 volts, and delivering to an electric tram, an auxiliary hoist, and a 75-h.p. induction motor driving an Ingersoll-Rand, two-stage, 650-cu.ft. compressor. A fourth set of lines carries the usual voltage to Cook shaft hoist station at Smith mine, where, after being transformed, it is delivered to two 75-h.p. induction motors driving two Ingersoll-Rand, 650-cu.ft. compressors, to one motor driving a 100-h.p., Wellman-Seaver-Morgan, two-drum hoist, and lastly to a 30-h.p. motor driving a vertical triplex pump near the sump at the foot of Cook shaft.

The compressor installation at the A & B distributing station, together with the auxiliary compressors at the other hoist houses, consume the greater part of the power generated by the four plants. The total air equipment, which includes sev-

eral emergency, steam-driven compressors, can deliver about 12,000 cu.ft. of free air per minute at 85-lb. gage pressure at the machines.

An electric-locomotive haulage system is installed in the Joker & Bonanza mine, the tram cars being dumped at the shaft pockets by electrically operated tipples.

Cost of Power

In 1910, the average cost of power from the four generating stations, per kilowatt-hour, was $0.009 for operating only, or $0.013 for a total. The cost per ton of ore mined was $0.164 for operating only, or $0.191 including fixed charges. The consumption of power averaged 13.8 kilowatt-hours per ton of ore mined.

The distribution of load in kilowatt-hours during 1910 was: Compressors, 4,797,918; mills, 1,967,776; hoists, 755,599; pumps, 207,061; miscellaneous, 475,867; commercial power, 575,579; total, 8,779,800 kilowatt-hours.

Comparison of the power costs for compressing and hoisting at the Harmony electric plant and at the Joker & Bonanza steam plant, showed a saving of nearly 3c. per ton of ore mined in favor of the former. Costs for power at the electric plant totaled $0.0451 per ton mined; at the steam plant the items were:

HOISTING	
Coal	$0.0507
Labor	0.0074
Supplies and repairs	0.0053
COMPRESSING	
Coal	0.0062
Labor	0.0019
Supplies and repairs	0.0024
Total	$0.0739

The steam plant at the Joker & Bonanza mine is now being replaced by an electric hoist and electric-driven compressors.

Mexican Labor on Concrete Work

By Fred Mac Coy*

Concrete work in Mexico bumps up against conditions not ordinarily encountered in the United States, and the boss who can adjust his work to these conditions usually gets more work done, and gets along more happily than the man who is too insistent on non-essentials.

Mexicans as a class are great sticklers for *los costumbes*, hence any work once taught them will be carried out invariably as first shown. Should a gang be moving heavy timbers and José be put to placing pipe rollers, not for one moment would Pedro think of placing a roller should José be employed elsewhere. To the laity, Mexicans have quite a reputation as masons, and as a proof of their skill attention is called to the innumerable arches and vaults that have stood since Cortez' time; but I have often wondered what would happen to these arches should they experience one winter of freezing and thawing, such as is common in, say, the Ohio valley.

Old Masonry Not What It Seems

I well remember that in my earlier days in Mexico I used to wonder how the mason ever got such huge rocks into such high walls, but this was somewhat abruptly explained upon reading a paragraph in "Instructions to Engineers," by Louis Kingman, former chief engineer of the Mexican Central Railway. In speaking of rubble masonry, he said: "The Mexicon custom of stones, one on the face of the wall and one on the back, and then filling in with spalls, will not be allowed."

This item caused me to investigate several old walls in the vicinity of Guanajuato, and to my surprise I found in most cases that the large stones were merely pieces of flagging standing on edge and backed with spall work. However, to return to concrete facts.

Concrete-mixing machines are too new in Mexico to be in general use, so for some years to come by far the greater amount of concrete will be hand turned. The shovel most commonly found among Mexican miners is a spear-pointed shovel with a long handle, which, for some reason, they insist in cutting off to a bevel-pointed end. Railroad laborers, being more used to handling a spade-handled shovel, more quickly become good mixers.

With a new gang considerable trouble will always be experienced in breaking them in to handling a wheelbarrow, and after learning how to wheel in a straight line they always insist in dumping sideways. Their own way of moving earth is by a handbarrow, taking two men to carry one-half of what one man can handle in a wheelbarrow. In fact, there seems to be an axiom among Mexican laborers to "never let one man do what two men can do just as well."

Cement Best Transported in Sacks

Another method which they have for moving material is by a sack carried on the back, and supported by a strap that passes around the forehead. In a deep excavation a man will fill a sack, and then by the aid of another laborer, get it on his back and climb up a ladder out of the pit. I have seen sacks of cement weighing 50 kilograms carried for miles in this manner.

On account of the difficulties in transportation in Mexico, all of the cement made in the country is packed in sacks, but most of the imported stock comes in barrels that have to be opened and the cement repacked if it is intended for use away from the railroads. On a job of any considerable size it is best to put a checker to watch the mixing, as the carriers will continue to empty their sacks on the pile until someone stops them. I have found that they are faithful about their mixing, but not reliable about the proportioning.

Mexican carpenters have to be closely watched on form work, for while they will always do a neat-looking job, they seem to think that the dimensions on the plans are to be followed only when it is convenient, and that if they can add to the general result by little additions in the way of ornamentations, they are overlooking a good bet not to do so. It is rather unusual to find a piece of concrete work or masonry in Mexico that has not somewhere on it a little cross and the date of erection, and often the foreman's name. But for all of these childlike qualities, there are lots of good workmen among the bunch when they have been sorted over, and with the proper kind of training they became efficient.

The principal thing in a successful handling of the average Mexican laborer is the ability to think in Mexican, or from his viewpoint. Should an engineer make a success of handling his workmen on one job and move to another, it will be no time before most of his old gang will have followed him there looking for work. Of course, this is more or less true the world over, but I have never found any other class of laborers that puts so much faith in the ability of their *patrón* to get them a job.

Best to Assign the Day's Work

Wherever possible it is best to lay out the day's work in *tareas*, or tasks. Should it be found that one man can dig out three meters of excavation, then the gang should have a task laid out in proportion and be allowed to go home when the work is done. In this way better headway will be made than by trying to get all there is out of them in the full day's time, for if anyone knows how to make a job last, Señor Peon is the fellow. In some classes of work it is advisable to give straight contracts at so much per unit of work.

I remember one job I had where it was necessary to provide several carloads of aggregate for a concrete wall. I at first placed men to work breaking stone, requiring so many barrelfuls for a day's work, but I changed over to paying so much per barrelful. One old fellow took a contract to fill a car per day, and I wondered when I looked at him just how he was going to do it. Next morning the old fellow showed up with what I suppose were all of his relations: old women, children, cripples and pet animals. Every person had a bucket made from an old powder can, and instead of breaking rock they hustled around and picked small rock from the spall dump and kept the cars filled. These are some of the odd things that an engineer is apt to find down here, but taking the Mexican laborers as a class, they are "not so worse," when once understood.

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NEW PUBLICATIONS

MINERAL PRODUCTIONS, COUNTY MAPS AND MINING LAWS OF CALIFORNIA. Pp. 116. Bull. 60, California State Mining Bureau, San Francisco, Cal.

RECONNAISSANCE OF THE ORE DEPOSITS IN NORTHERN YUMA COUNTY, ARIZONA. By Howland Bancroft. Pp. 130. Bull. 451, U. S. Geological Survey, Washington.

THE LANDER AND SALT CREEK OIL FIELDS, WYOMING. By E. G. Woodruff and C. H. Wegeman. Pp. 87. Bull. 452, U. S. Geological Survey, Washington.

GEOLOGY AND UNDERGROUND WATERS OF SOUTHERN MINNESOTA. By C. W. Hall, O. E. Meinzer and M. L. Fuller. Pp. 406. Water-Supply paper 256, U.S. Geological Survey, Washington.

MINERAL RESOURCES OF THE LLANO-BURNET REGION, TEXAS, WITH AN ACCOUNT OF THE PRE-CAMBRIAN GEOLOGY. By Sidney Paige. Pp. 103. Bull. 450, U. S. Geological Survey, Washington.

QUELQUES MOTS SUR L'INDUSTRIE METALLURGIQUE RUSSE. By Hippolyte Gliwitz. 6½x9, pp. 20, paper. Exposition Internationale de l'Industrie et du Travail à Turin, Russian section, St. Petersburg.

INFLAMMATION DU GRISOU PAR LES FILAMENTS INCANDESCENTS DES LAMPES ELECTRIQUES. By Emmanuel Lemaire. Extrait des *Annales des Mines de Belgique*, T. XVI. Pp. 47. Ministère de l'Industrie et du Travail, Brussels, Belgium.

QUELQUES MOTS SUR LE DÉVELOPPEMENT RÉCENT DU PROCÉDÉ DE CREUSEMENT DES PUITS PAR CONGÉLATION ET SUR LA SÉCURITÉ DANS LE FONÇAGE DES PUITS. By Ad. Breyre. Extrait des *Annales des Mines de Belgique*, T. XVI. Pp. 55. Ministère de l'Industrie et du Travail, Brussels, Belgium.

THE RESOURCES OF TENNESSEE. Published monthly by the Geological Survey of Tennessee. First number, July, 1911.

The publication of this monthly bulletin is an innovation of the Tennessee Geological Survey, by which it is hoped that results will become immediately available for general use. It is, in addition, hoped to advertise the resources of the State in this way.

COPPER DEPOSITS OF THE APPALACHIAN STATES. By Walter Harvey Weed. Pp. 166. *Bull.* 455, U. S. Geological Survey, Washington.

In this volume of 166 pages, Mr. Weed has collected all the information available concerning the interesting copper deposits of the Eastern States, which have been worked since an early period in the history of the United States. In the "Western course of empire," most of these deposits have long been forgotten, and yet Mr. Weed thinks it not impossible that some of them could be worked on a commercial scale with profit; for this reason he goes into detail in describing practically all the deposits, whether they appear to be of present commercial importance or not.

Among others, Mr. Weed describes the geological and mineralogical occurrence at such famous old localities as the Ely mine, of Vermont, the Davis mine, in Massachusetts, the Schuyler mine, of New Jersey, the Virgilina district, of Virginia, the Gold Hill mines, of North Carolina, concluding with the only large copper mines in the East now working on a commercial basis, namely, the immense copper deposits of the Ducktown district.

Discussing the origin of the ores, Mr. Weed classifies the Appalachian deposits into six types, as follows: (1) Ducktown type, consisting of pyrite lenses and veins in crystalline schists. (2) Copper, quartz-vein type, consisting of quartz veins containing metallic sulphides. (3) Carolina type, bands of amphybolite traversing mica schists and carrying chalcopyrite and pyrite disseminated through the rock, or, more commonly, deposited in the gray gneiss alongside. (4) New Jersey type, impregnated shale and sandstone adjacent to diabase masses. (5) Pahaquarry type, Devonian sandstone impregnated with copper ores. (6) Blue Ridge type, bunches and joint fillings in the surficial portions of basaltic rock of the Blue Ridge region.

TASCHENBUCH FUR BERGMAENNER (HOEFER'S POCKET BOOK FOR MINERS) unter Mitwirkung mehrerer Fachgenossen herausgegeben von K. k. Hofrath Hans Höfer, Edler v. Heimhalt, of Loeben, und K. k. Oberbergkommissar Hans Höfer, of Mährisch-Ostrau. Dritte vermehrte und verbesserte Auflage. Ludwig Nüssler, Loeben, 1911.

The first edition of Höfer's famous miners' pocket book appeared 15 years ago. During that period, the arts and sciences connected with mining have been both advanced and multiplied. New applications of power, new materials of construction, new machines and new methods have reinforced or superseded the old ones. We might almost say that new ores of the commonest metals have been brought under exploitation. An ore is not merely an aggregate of certain minerals, but one which can be profitably mined; and the low-grade materials which are now worked on an immense scale for iron, lead, copper, zinc, etc., were not ranked as ores at all a few years ago; and the systems of mining, involving the rapid and cheap excavation, transportation and mechanical preparation of enormous quantities of such materials have well-nigh revolutionized the practice with which a mining engineer has to deal.

It is not surprising, therefore, that the veteran editor of this work, in preparing a new edition, has found it necessary to enlarge almost every chapter of the book, besides adding two entirely new subjects—the briquetting of coal and ores, and the principles of air compressors. As a consequence, the "pocket book" is a pocket book no longer, either in size or character, but a compendium of 1152 pages in two volumes, not likely to be be carried about, even in two pockets, for rapid consultation in the field, but rather adapted for use in the office, or as a guide to the study of more elaborate treatises. It is beautifully printed and contains 446 (mostly diagrammatic) illustrations. In the labor of revision and enlargement, Councilor Höfer has been assisted by his son, and by a large number of special contributors in Germany and Austria, comprising many distinguished Austrian engineers, and professors in the ancient and celebrated mining school of Loeben. Each of these has written a chapter, treating of a specialty with which he is familiar, so that the book contains many brief monographs of recognized high authority.

The first volume comprises chapters on mineralogy, geology and ore deposits; prospecting; boring; stoping; mechanical mining; mine workings (adits, levels, shafts, etc.); methods of exploitation; mine supports (timbering, masonry, dams, etc.); haulage and hoisting; manways, etc.; ventilation, and the valuation of mining enterprises.

The second volume discusses mining machinery for transportation, pumping and ventilation; the mechanical preparation of ores and coal; coking; the briquetting of coals and ores; mine surveying, and electrical engineering.

It is easy to praise, and likewise easy to criticize, such a book. On the side of criticism, one might say truly that it is too detailed in some places and too meager in others; and that it is specially deficient in its discussion of the most modern and most important features of American practice. But American engineers do not go to a foreign book to learn about American methods. We have a technical literature of our own, which is adequate and admirable for that purpose. What we are eager to learn is the best practice abroad, and its economic results. The more thorough technical education of this generation has taught us to estimate with greater respect (though without the old superstitious reverence) what the trained experts of other lands are achieving or attempting; and from this standpoint the summary furnished by the book before us is suggestive and helpful in the highest degree.

R. W. RAYMOND.

Hulton Colliery Explosion

Special Correspondence

Inspector Redmayne concludes that fall of roof, in this British mine, liberated gas which was ignited by injured safety lamp; explosion transmitted by dust in spite of precautionary watering of airways.

This explosion occurred on Dec. 21, 1910, the lives of 344 persons being lost, 343 directly from the explosion and one during the subsequent rescue operations. The formal investigation for the Home Office was conducted by R. A. S. Redmayne, chief mine inspector, and his report has recently been issued by the department.

The Hulton colliery really comprises four distinct collieries, with seven hoisting shafts, 2400 tons of coal being raised per day, averaging one ton for each person employed above and below ground. Shafts Nos. 3 and 4 are each 18 ft. in diameter, and placed 75 yd. apart, No. 4 being the downcast and No. 3 the upcast shaft. Both shafts are sunk to the Arley seam, at a depth of 434 yd., and from them five seams are being worked, namely:

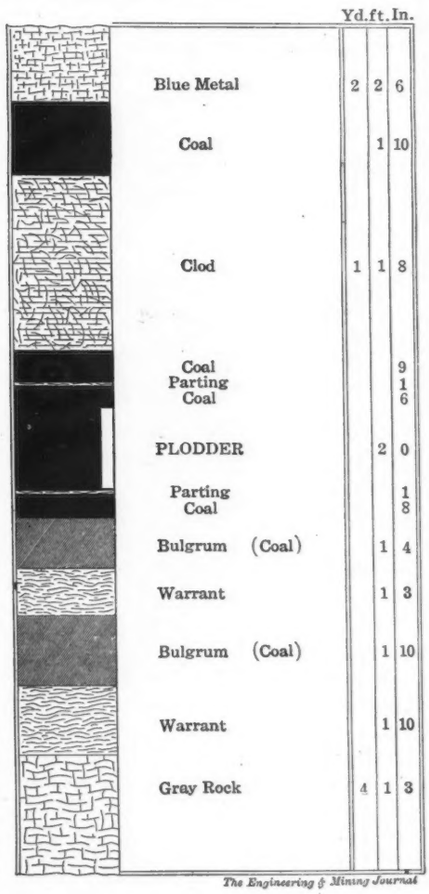
	Thickness, Ft.	Thickness, In.	Depth in Yards from Surface
Trencherbone	3	6	146
Plodder	2	0	274
Yard (with intervening parting of about 18 in.)	3	11	306
Three-quarters.....to	1	5	361
	1	6	
Arley	2	11	434

The general dip of the seams is to the south at an average inclination of 18 per cent.

A large east and west fault, traversing the mineral tract worked from shafts Nos. 3 and 4, and another almost at right angles to the first, have conduced to an arrangement of rock crosscuts which allow three seams to be worked from one level in No. 3 shaft, viz., the Plodder, Three-Quarters and Yard seams, and it was on this level that the explosion occurred. There are five main workings on this level, known respectively as the North Plodder, the Three-Quarters, the Top Yard (or Up Brow), the Bottom Yard (or Down Brow), and the South Plodder. The longwall system is employed.

Ventilating System

Ventilation of the workings in shafts Nos. 3 and 4 was effected normally by four electrically driven Sirocco fans placed below ground. Three of these were exhausting and one a forcing fan. The fans were placed, one in the Arley seam, another in the Three-Quarters, a third in the Yard seam, and a fourth in the Trencherbone. The forcing or compressive fan was the one used in shaft No. 3 workings, this means of ventilation having been adopted, instead of that by exhaustion, because the coal brought to the shaft at the Yard seam level was hoisted at the upcast shaft. It was for this reason that the coal was hauled through the return airways of No. 3 mine. Had an exhausting fan been used it would have placed an obstruction in the "mouthing," and so have impeded the hoisting of the coal. The fan was placed close to the downcast shaft, sucking the air therefrom and forcing it round the workings.



Plodder Mine Section

Figures elicited at the inquiry show that the air was circulating at the rate of 174 cu.ft. per man per minute in the No. 3 shaft, and Mr. Redmayne says it should have been ample to meet the requirements of the mine if properly utilized. His conclusion is that the longwall faces were swept by brisk currents of air, and firedamp had never been detected in the body of the air current at any of the faces, under normal conditions of working. Gas did, however, occur at certain parts of the mine.

The heading at the extreme end of No. 1 entry in the North Plodder workings, which was 12 yd. wide and driven 17 yd. in advance of the longwall face, constituted a *cul de sac*, up the west end of which was carried a stone pack to within a few feet of the face; a portion of the air current from along the longwall face passed up and ventilated this heading in the manner shown in Fig. 1. This was just the place in which an inspector would expect to find gas. The air current would be somewhat slack when the canvas sheet was not hanging across the end of the longwall face where the air current entered the return airway. This sheet was placed there with a view to diverting into the heading more air than would naturally split from the main current, but while the conveyer was carrying coal to the cars in the return airway, the flap would be held up. Making an inspection of the place two days before the inquiry, Mr. Redmayne was able to obtain a ¼-in. cap on the flame of his safety lamp when it was held up near the roof and against the coal face at the west corner, but there was no indication of gas in the general atmosphere of the place, although the ventilation had not been completely restored.

In the Top Yard workings, occurrences of gas in quantity at the face were by no means uncommon and were due chiefly to the proximity of a large fault. As the east-side working places approached this fault, gas began to show in them. Mr. Redmayne concludes, however, that the regulations in respect to the manner of ventilating this part of the face were properly observed.

Dust Thick in Mine

Quantities of dust were made at the coal face in the North Plodder, where mechanical cutting and mechanical conveyance of the coal into cars were in operation; it escaped into the return airways, which served also as haulage roads. Further, during the haulage of the coal to the shaft, dust was blown off the loads, or pieces of coal dropping off were crushed into dust. The seams, being dry and the coal fairly friable, conduced to the formation of dust. That from the Plodder seam, the coal from which contains not less than 38 per cent. of volatile hydrocarbons, is what is known as an extremely "quick" dust.

Water mains were laid along all the main haulage roads, fitted at short and

regular intervals with nozzles from which water was twice a week systematically squirted on the roadway; Mr. Redmayne assumes that this would deal completely with the floor dust, over the length covered by the piping, but the inside lengths were dealt with only by occasional cleaning up of the dust. Put briefly: (1) The protective zones were in the vicinity of the shaft and extended inwardly for a considerable distance; (2) these zones were imperfect as means of retarding the propagation of an explosion, inasmuch as the dust clinging to roof and sides was not effectively removed.

The type of lamp in use in the mine was the Wolf safety; no other lamps, except the electric lights about the shaft bottom, were employed. The Wolf lamps, which burned a mineral oil with a low flash point, were magnetically locked. This lamp is fitted with an internal relighting device, a strip match, which is pulled against a rough surface by means of a key inserted in the bottom of the lamp. Persons authorized to relight lamps were permitted to do so anywhere along the face, if they considered it safe to do so. It was left to their discretion.

Electrical Equipment

A large electrical power plant is stationed between shafts Nos. 3 and 4 and serves all the mine groups comprising the colliery. The plant is capable of generating 2500 h.p., the power being transmitted as three-phase current at a pressure of 2500 volts. Exhaust steam from the hoisting engine is used to operate the turbines which drive the generators. At each shaft the current is transformed down to medium pressure for use in the workings.

Thus at shafts Nos. 3 and 4, the current was conveyed down at 465 volts, two separate cables being carried down No. 4 shaft and two cables down No. 3 shaft to the Yard seam. There were, in addition, other cables in each shaft which carried current to the Trencherbone and Arley seams. Electricity was in use in the Yard seam level at the shaft sidings in the neighborhood of the downcast shaft, and in two of the five main districts, viz., the Bottom Yard (two electrically driven pumps) and the North Plodder (haulage, coal cutters and coal conveyer).

At the bottom of downcast shaft No. 4 were two switchboards by which the supply of current to the various motors was controlled. The following motors were installed close to the downcast-shaft bottom in the Yard seam (see Fig. 2):

(*A*) A 45-h.p. slip-ring motor, driving a ventilating fan.

(*B*) An 80-h.p. squirrel-cage motor, driving main rope haulage.

Apart from the above, the only motor actually in the Yard seam was (*C*), an 80-h.p. motor, driving a three-throw pump. This motor was situated about 180 yd. from the downcast-shaft bottom.

In the North Plodder seam, or in the drift leading thereto, were the following motors:

(*D*) A 22-h.p. squirrel-cage motor driving a coal conveyer, the motor being fixed about 40 yd. down the drift.

(*E*) A 20-h.p. squirrel-cage motor driving coal cutter No. 1.

(*F*) A 20-h.p. squirrel-cage motor driving coal cutter No. 2.

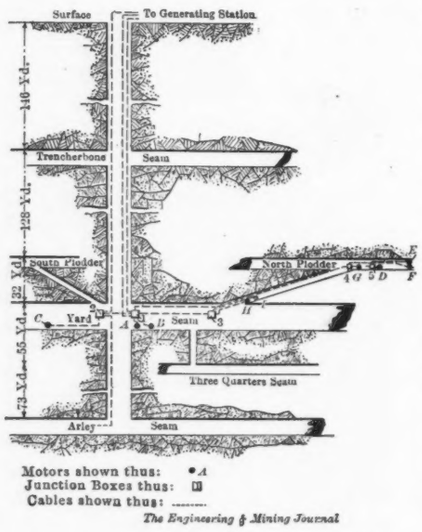
(*G*) A 30-h.p. slip-ring motor driving an endless-rope haulage.

(*H*) An 8-h.p. slip-ring motor, the slip rings being short-circuited, driving a haulage.

(*I*) A 5-h.p. squirrel-cage motor driving an electric fan.

In addition to the above, there were 60 or 70 lamps at and near the shaft bottom, 16 lamps near motor *C*, and 4 lamps near motor *G*.

Motors *A*, *B*, *G*, *H* and *I* appear to have been running at the time of the explosion. Motors *A*, *B* and *C* were placed in intake airways, and they were all relatively close to the downcast-shaft bottom. Motors *D*, *E* and *F* were at or near the coal face, and motors *H* and *I* were in return airways, both being fixed in a place at a distance of approximately 400 yd. from the shaft bottom. Motor *G* was fixed at a point in the return airway 600 yd. from the shaft bottom, but the motor house was ventilated by a fresh-air split.



Electric Equipment, Yard Mine

All the cables in roadways were armored and many of them lead-sheathed and armored. There were, however, lengths of unarmored mains between switches and motors in every case. In the downcast shaft was one set of bare cables supported on insulators; otherwise the shaft cables were insulated, lead-covered and armored. The coal-cutter face was cut during the night, when the majority of the men were not at work, but the conveyer was in operation during the day when the coal-loading shift was at work.

For some years past the coal has been broken without shot firing, a hydraulic wedge being used when great force was required to bring it down. The only blasting has been for ripping and tunneling, this being done between shifts, when practically the only persons below were those engaged in firing the shots.

The thickness of coal worked in the North Plodder seam is about 2 ft., the undercutting being made in an underlying band of inferior coal 8 in. thick, the floor consisting of a bed of inferior coal locally termed "bulgrun," about 1 to 4 in. thick. Above the seam of workable coal is a dirt parting 1 in. thick, and above this again 9 in. of coal which was not worked but was allowed to fall in the waste. Above that coal is a bed of shale termed "clod," 4.7 ft. thick, which formed a bad roof and was likely to fall; next comes a seam of coal 1.8 ft. thick, which contained much gas and was not worked, constituting an unstable roof very likely to fall. Above this coal was a thick bed of "blue metal," which, being rock of an impervious nature, would tend to prevent the escape of gas from the upper seam just alluded to. Here are presented all the conditions favorable to the discharge of gas when a fall in the roof occurred.

Probable Cause of Explosion

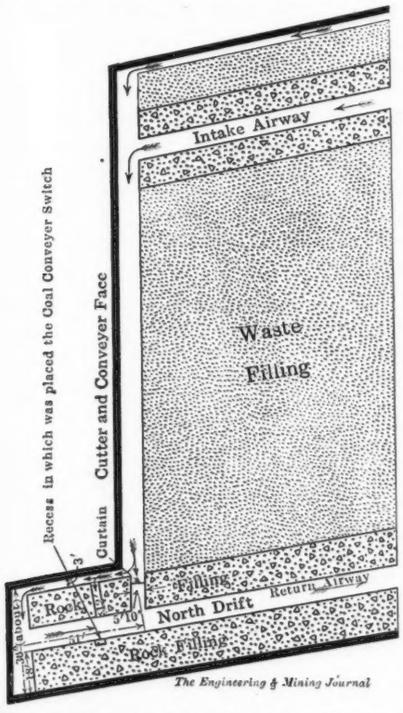
Mr. Redmayne's conclusion is that the explosion originated at a point where persons were engaged in working at a fall at the inmost point of the intake airway to No. 2 face of the North Plodder. In all probability a second fall occurred immediately before the explosion, accompanied by the liberation of a quantity of gas, which was ignited by an overheated safety lamp, which fell through the gas, or was damaged by the fall of rock. The coal face itself was dusty, and the dust in No. 2 east level carried the explosion to the main haulage road of the North Plodder, whence the dust of the other roads transmitted it through the rest of the mine.

Expressing the view that the Hulton colliery was understaffed, Mr. Redmayne says there should be either some limit on the area under one management, or the manager should be required to exercise a certain definite amount of daily control, as well as the undermanager. In order to fulfil the latter requirement there should be a thorough system of daily reporting whereby the manager may be kept in daily touch with all his officials.

It is pointed out that only by the elimination of flame and sparking can collieries be rendered immune from explosions of gas and coal dust. As regards the safety lamp, even when in a state of proper repair, it is only safe under cer-

tain conditions, and methods for replacing, or partially displacing, the gauze lamp by the electric lamp in fiery mines is a subject deserving the most serious consideration of mining engineers.

The spread of the explosion was due to the presence of coal dust. In his comments on this, Mr. Redmayne says that short of absolute removal of the dust, or the production of a saturated atmosphere, rendering the dust innocuous, it is doubtful whether any positive means have as yet been devised for annulling the dust danger in collieries. So far as investigations have proceeded, it does not appear that the quantity of coal dust present is of great importance. Recent experiments in France have shown that it was possible to obtain an explosion of coal dust when it was present to the amount of only 56 grams per square meter. Complete removal of dust is prac-



NORTH PLODDER FACE, HULTON COLLIERY

tically impossible, while watering might occasion trouble in the roadways and, under certain conditions occasioned by temperature, adversely affect the health of the miners. Further, Mr. Redmayne is not yet satisfied that the adulteration of coal dust in the mine with stone dust is a practical solution of the difficulty; he inclines to the view that it may perhaps be solved by providing specially prepared zones in the workings—the nearer to the face the better—which will be kept free from dust and, where possible, made damp, the idea being to prevent an explosion at the face from spreading beyond the district in which it occurs.

Mr. Redmayne approves the placing of mechanical ventilators underground only as auxiliary means of ventilating a mine when the workings are extensive, considering it better to place the main ventilator at the surface. He adds: "It is inadvisable to drive the main mechanical ventilator of a mine by an electric motor of fixed speed. A fan cannot be regarded as an apparatus which is subject to an unvarying speed; it may at any moment be found necessary to increase or decrease considerably the number of its revolutions, depending on the condition of the mine, for which purpose steam is the most adaptable power; and it is well to have a spare engine for breakdowns."

Discussing electrical plant, Mr. Redmayne thinks it unwise to use electricity at the coal face in a gassy mine, and points to the most frequent causes of accident underground as: (1) Live parts left uncovered by insulating material, and insulating material left unprotected from the risk of mechanical damage; (2) the absence of a sound connection to earth for metallic outer coverings.

It is generally agreed that pressure should be cut off from electrical apparatus as a precautionary measure upon the first appearance of firedamp; but apparatus can and should be designed so that if gas should unexpectedly appear, unknown to the workmen, there is still no risk of its ignition. This is not, however, equivalent to saying that such apparatus may be installed or used where gas is likely to occur, for there is always the risk due to lack of vigilance. Mr. Redmayne is impressed by the importance of proper maintenance of electric plant. However well designed the apparatus, its safety may still depend upon constant supervision and efficient maintenance.

The Iron Institute of Sweden

One of the more efficient trade organizations of the world is the Järnkontoret, or Iron Institute, of Sweden, which is described as follows in a translation forwarded by U. S. Consul Stuart J. Fuller, at Gothenburg:

The Järnkontoret, or Iron Institute, is a private institution, peculiar to Sweden, and has for its object the support and advancement of the Swedish iron industry. Most of the iron works in Sweden are partners in the institute (the partnership being confined to the works exclusive of individuals), and their shares are estimated on the output of iron each has been able to register at the time of joining.

The institute is supervised, in the first place, by the Brukssocieteten (Society of Manufacturing Estates), a general meeting of which is held once a year. Every sole or joint proprietor of a manufactory holding shares in the Järnkontoret is a member of the Brukssocieteten. At the general meetings of this organization the votes depend on shares held.

The affairs of the Järnkontoret are managed by a council consisting of five ordinary and five associate members, the latter being called only when matters of great importance are under discussion. The current work is superintended by two of the ordinary members, one as managing director and the other as "delegate on duty."

An ordinary banking business is carried on, and members are entitled to certain privileged loans (advances, accident loans and building advances). They also have the privilege of receiving further loans before other applicants.

The institute possesses funds amounting to $1,911,093, which have accumulated from subscriptions and entrance fees as well as from the profits made on the banking business. The subscriptions, the so called Järnkontorsdalern, are still fixed at 2½ öre ($0.0067) per centner (93.7 lb.) of the originally registered output. No dividends are paid to the partners, but the profits obtained, when not required for technical purposes, are added to the funds. The expenditures for 1910 amounted to $139,360 and the income was $149,276 for the same year.

The technical and scientific advancement of the iron industry is assisted in several ways. A staff of technical specialists is employed, who give advice to members and to the industry in general and make propositions in the iron industry and kindred trades. At present six engineers, one chief engineer, and two ironmasters are employed. Three of the engineers specialize in metallurgy, one in matters regarding charcoal and the dry distillation of wood, another makes a special study of peat-moss litter and of electricity in the iron industry, and another is employed chiefly for mechanical engineering.

Yearly grants are made by the Järnkontoret for experiments in the iron industry, to mining schools, and to technical laboratories at home and abroad. Geological researches and technical papers and periodicals are also supported and grants are voted toward the cost of representing the Swedish iron industry at exhibitions at home and abroad. The Järnkontoret granted $67,000 for the establishment at Trollhättan of the experimental works for electric iron smelting.

By means of yearly stipends opportunities are offered to students leaving the mining schools to gain further experience, preferably practical, in the mining industry, and financial support is given to engineers possessing a thorough practical knowledge of the Swedish mining industry in order to enable them to obtain foreign experience. In recent years sums have also been voted toward the expenses of workmen traveling to gain experience, and sums are granted every year for the protection of Swedish iron brands abroad. Since 1817 the Järnkontoret has issued a periodical, *Järnkontorets Annaler,* which is one of the oldest metallurgical papers.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. W. Miller has returned to New York from a visit to northern Ontario.

T. Lane Carter, of Chicago, is reporting on some mining properties in Chihuahua, Mexico.

R. B. Lamb, mining engineer of Toronto, has left for an extended visit to Porcupine, Ontario.

John I. Kane, of Kane & Parsons, mining engineers, El Paso, Tex., is in Cusihuiriachic, Chihuahua.

Kirby Thomas, of New York, is making an examination in the new West Shining Tree gold district in Ontario.

H. W. Hardinge has left New York for Iceland by way of Denmark on a professional mining investigation.

W. M. Dake, Jr., has left the Goldfield Consolidated mill, and is now at the Nevade Hills mill at Fairview, Nevada.

Lawrence N. B. Bullock is now with the Mexico Mine and Smelter Supply Company, with headquarters at Mexico City.

John Redington has been appointed manager of the Swastika mine, Ontario, in place of M. W. Summerhayes, resigned.

Doctor Meyer, of the University of Berlin, is in southern California making a critical study of the oilfields and the mineral industry.

J. E. McAllister, of New York, lately visited the British Columbia Copper Company's mines and smeltery in the Boundary district.

William Allen Smith has been appointed superintendent of the smelting works of the St. Joseph Lead Company, at Herculaneum, Mo.

J. W. Donnelly is reported to have resigned his position as superintendent of the Goldfield Consolidated, and will make his home in Los Angeles.

Prof. D. W. Mead, of the University of Wisconsin, has been in East Kootenay, B. C., examining the property of the Bull River Electric Company.

Frederick F. Sharpless recently returned to New York from a visit to Alaska and British Columbia. He will leave in a few days for Durango, Mexico.

Horace McKilborn, Joseph Walker, Jr., Richard Sutro and Herman A. Keller have been elected additional directors of the Tennessee Copper Company.

George Otis Smith, director of the U. S. Geological Survey, recently paid a visit to the Northwest. He was at Spokane and Seattle, Wash., late in August.

R. M. Keeney has resigned as instructor in metallurgy at the Colorado School of Mines, and has been appointed metallurgist for the British Yukon Gold Mines, Ltd., at Carcross, Yukon, Canada.

Prof. W. L. Bahney, of the department of metallurgy at Stanford University, California, has tendered his resignation to take effect this fall, when he will become a member of the faculty at Yale.

R. B. Brinsmade has resigned the professorship of mining at West Virginia University and has resumed engineering practice. He is now superintendent of the Minas de Flojonales, Durango, Mexico.

Wilbur A. Hendryx is now in London, superintending the putting in of the Hendryx agitators and dewaterers in a laboratory and testing plant for Head-Wrightson & Co., Ltd. He will soon leave for South Africa.

Hon. William Templeman, minister of mines for Canada, is seeking election for Victoria, B. C., in which constituency he was defeated last election. The main issue the election is being fought on is the reciprocity treaty.

A. N. C. Treadgold has returned to Dawson, Yukon, from a six months' visit to London and New York in connection with the flotation of the Cranville Mining Company, to hydraulic and dredge gold gravels near Dawson.

F. J. Longworth has been transferred from the superintendency of the British Columbia Copper Company's Napoleon mine and stamp mill, at Boyds, Wash., to the company's smeltery at Greenwood, B. C. H. A. Brandt is now acting superintendent at the Napoleon.

O. P. Hood, head of the department of mechanical and electrical engineering at the Michigan College of Mines, has been appointed chief mechanical engineer of the United States bureau of mines. He will take up his headquarters in Pittsburg in September.

H. D. McGlashen, chief of the water resources branch of the U. S. Geological Survey, has removed his office from Los Angeles to San Francisco. There are 10 engineers in the field in the district; 120 gage stations have been established in California, and 50 new stations authorized.

J. R. Roaf, who has been in charge of the Crow's Nest Pass Coal Company's engineering department at the Coal Creek and Michel collieries, and coke ovens at Fernie and Michel, all in British Columbia, has resigned, and gone to one of the new coal districts near Edmonton, Alberta.

Dr. Milton L. Hersey, president of Milton Hersy Company, Ltd., chemists and mining engineers, of Montreal, well known in eastern Canada, has been nominated as the Liberal candidate to oppose H. B. Ames in St. Antoine division of Montreal and, if successful, to support the reciprocity pact between Canada and the United States.

John Williams, for many years secretary-treasurer of the Amalgamated Association of Iron, Steel and Tin Workers, has been elected president of that organization to succeed P. J. McArdle, who resigned to take up his duties as a councilman of Pittsburg. M. F. Tighe, for several years assistant secretary, has been elected secretary and treasurer.

Francis H. Shepherd, of Nanaimo, B. C., chief inspector of mines for British Columbia, recently took the prescribed course at the United States Mine-Rescue training station, at Seattle, Wash. The station has been closed for some time, but the director of the U. S. Bureau of Mines ordered the necessary arrangements made to allow Mr. Shepherd to take the regulation training course.

OBITUARY

L. A. McIntosh, owner of the Midas gold mine in Shasta county, Cal., died at San Francisco, July 21. He had gone to San Francisco to avoid the heat, and suffered from a complication of diseases.

John L. Harris, of Sharon, Penn., a chemist, died Sept. 2 as the result of injuries received at the Sharon blast furnace plant of the Carnegie Steel Company. He was a graduate of the Pennsylvania State College.

William Barklage, principal owner of the Georgia Slide mine in Eldorado county, Cal., died at Georgetown in that county, on Aug. 20. He was 71 years old, and went to California from England at the age of 13 years.

SOCIETIES and TECHNICAL SCHOOLS

American Institute of Mining Engineers—A meeting of members of the New York section of the American Institute of Mining Engineers will be held in the assembly room of the United Engineering Society building, New York, Sept. 22. Charles P. Perin, consulting engineer of the Tata Iron and Steel Company, will deliver a lecture, illustrated by lantern slides, on "The Iron and Steel Industry of India." Immediately preceding the lecture the committee on organization will submit its report for approval.

American Institute of Chemical Engineers—The secretary gives notice that the fourth annual meeting of the Institute will be held in Washington, D. C., Dec. 20 to 22. A number of important papers will be presented on the general subject of "Patents," and the "Manufacture and Testing of Explosives," as well as on a number of other important chemical engineering subjects. One day will probably be devoted to visits to the technical chemical-engineering plants in Baltimore and vicinity. Visits to laboratories and other points of interest in Washington will also be arranged for.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

Sept 6—The plan for the entertainment in October, of the American Institute of Mining Engineers as arranged in May, has been finally approved by a recent meeting of the San Francisco members and will be subject only to such changes of details as may seem necessary to the satisfaction and convenience of the members during the visit to California. The points of practical interest that California members will have most pride in bringing to the attention of the visiting engineers will be the oilfields and the dredging districts. It is not likely that the itinerary will extend beyond the chief fields of petroleum industry embracing Coalinga, Bakersfield and Los Angeles, nor embrace other than the chief dredging districts in Sacramento, Yuba, and Butte counties. An important feature of the dredging industry that should attract the visiting engineers is the advancement that has been made in the complete construction of dredges by California manufacturers.

The work to be done to increase the capacity of Lake Spaulding, near Nevada City, contemplated by the Pacific Gas and Electric Company, is a result of the demand of the mining industry in Nevada and neighboring counties. The work includes the construction of a concrete dam 300 ft. high, to raise the level of the lake 7 ft. and gain 1,000,000 miner's inches of water. The storage capacity of the lake will be increased to such an extent as to make it the second largest reservoir for power purposes in the world. Two electric power plants will be built, one with a head of 1647 ft., the other of 750 ft. and together generating approximately 70,000 h.p. The company will then have in operation or at command 250,000 h.p. including the steam plants in operation. This company furnishes electric- and water-power for dredging as well as lode mining. Its field of operation extends as far south as Fresno county, and includes many of the towns and cities in the region of San Francisco bay, where light, heat and power are furnished. The Lake Spaulding improvement is estimated to cost about $10.000.000.

Denver

Sept. 8—The mines at Central City and Black Hawk in Gilpin county are in a decidedly healthy and improved condition. This is in a great measure due to the new management of the Newhouse tunnel. The drainage part of its object has been accomplished, and the camp is practically dry, with 700 to 750 ft. of virgin ground to be opened without any pumping. The driving of the main tunnel having been completed, the new manager, Mr. Schirmer, is giving his attention to creating transportation business by driving laterals, and better still, by making reasonable contracts for the haulage of ore and waste. Ore is now being hauled through the tunnel from the Old Town, Saratoga, Gem, and other mines, and is already paying better than running expenses.

Work on the drainage tunnel at Cripple Creek was stopped for want of funds but money is being raised for its continuation. There is some difference of opinion among the subscribers as to the future course. One party desires to continue the tunnel, which was stopped in the granite, straight ahead into the breccia area where the mines are, reaching that area somewhere close to the Elkton mine; the other party thinks it best to leave the main course, and develop a big water flow by following some of the dikes intersected. These dikes are in the granite.

Butte

Sept. 6—For the month of August, the gold output from Madison county was $80,395, which was nearly a half of the total amount of gold deposited at the United States assay office at Helena by the counties of the State. This was largely due to the extensive placer mining done by the dredges of the Conrey Placer Mining Company at Ruby. The deposits from the various counties are as follows: Broadwater, $1182; Chouteau, $25,448; Deer Lodge, $468; Fergus, $25,558; Jefferson, $4219; Lewis & Clark, $7916; Lincoln, $772; Madison, $80,395; Missoula, $6102; Park, $153; Powell, $5555; Ravalli, $45; Silver Bow, $4821; making a total for Montana of $162,639.

Frank Campbell and associates, representing men from St. Joseph, Mo., have brought suit for $7000 damages against William Criderman and John H. Town, from whom they recently purchased 420 acres of placer ground near Libby. The basis of the suit is the title to 160 acres on Libby creek, claimed by the Libby Placer company.

Salt Lake City

Sept. 7—During a recent visit to this city, Joseph A. Holmes, director of the Bureau of Mines, emphasized the need of more knowledge of the properties and occurrence of the rare metals, giving this as one line of projected activity of the Bureau, in case Congress should extend its sphere of usefulness that far. In this connection it is of interest to note that a shipment of uranium and vanadium ore has been made from the Green river country near the boundary of Emery and Grand counties, amounting to between 600 and 700 sacks of ore carrying 8 to 9 per cent. of the oxides of these metals. The material is to be shipped to Europe in its present form.

A merger of the Daly and Ontario properties at Park City is being considered, and notices have been mailed to stockholders of both companies tentatively outlining the details of the consolidation. The proposed new holding company is to be capitalized at 300,000 shares, par value $5. Of this 150,000 shares are to go to the Ontario stockholders and 75,000 to the Daly in exchange for their present holdings. The capitalization of the Daly and Ontario is now 150,000 shares each, all of the stock being issued. The Daly has paid $2,975,000 in dividends, and the Ontario $13,945,500, the last dividend of the latter company of 30c. per share having been paid in Dec., 1902, while the last dividend of the Daly amounting to 25c. per share was paid June, 1897. The two properties own adjoining claims in Summit and Wasatch counties, and have many things in common, including valuable drain tunnel interests. The Ontario holdings comprise 801 acres of mining ground, while the Daly has 316 acres. Both have interests in various corporations, including the Park City Light, Heat and Power Company, in which the Ontario company is the larger holder, the Weber Coal Company of which the Ontario owns four-sevenths and the Daly three-sevenths, the Park City Waterworks Company, the Silver Lake Water Company, etc. The coal land is at Coalville, Utah, 25 miles from Park City.

The properties are drained by jointly owned tunnels, the Ontario No. 1 and the Ontario No. 2. Royalties are derived from the former from its use for transportation purposes, and from the latter from rentals paid for drainage privileges by the Daly West, Daly-Judge, and Thompson-Quincy mining companies. The Ontario has been operated largely by leasers during the last two years, and has about $81,000 cash on hand, chiefly derived from royalties. The Daly has a cash surplus of about $55,000. The Ontario also

owns about a third of the stock of the Naildriver Company, which is at present not being operated. The advantages claimed for the merger are that all the property now owned by each company and the corporations in which both have an interest would be brought under one management, thus eliminating the necessity of having two sets of officials, employees, etc., and largely reducing fixed expenses. The properties could be more economically developed by the new company, which would have a sufficiently large treasury fund to carry on more extensive prospecting, than either company separately could do at the present time. Each company has a large territory of unprospected mining ground. Work has been in progress for some time at the Daly, and encouraging ore showings have recently been reported. A meeting of the Daly stockholders will be held Sept. 20, and of the Ontario Oct. 10, for the purpose of considering the merger.

Pioche

Sept. 6—The passing of the control of the Amalgamated Pioche Mines and Smelters to L. Vogelstein & Co., came as a surprise to many Nevada-Utah and Ohio-Kentucky shareholders. Just as the merger of the Pioche properties was about consummated and the direction of affairs placed with E. R. Wooley, an entirely new interest, insofar as shareholders were concerned, entered the field. Western shareholders expect and rightly, that the new controlling company will issue a statement giving some idea of the program for the future. Information is desired of the capitalization and bonded indebtedness, if there be a bonded debt, as no adequate idea can be formed of the value of the stock of the various companies affected until such data are known.

Globe

Sept. 8—The directors of the Superior & Boston and Arizona Commercial companies have formulated a plan for consolidation which they believe will be acceptable to the shareholders of both companies. The Superior & Boston will increase its capital by 350,000 shares, par $10, making its total authorized stock 650,000 shares. Of this 200,000 shares, $5 paid in, will be offered in exchange for the $1,000,000 bonds of the Arizona Commercial Copper Company on a basis of 100 shares for each $500 bond, provided 75 per cent. of the bondholders accept this offer. A new bond issue of $600,000 drawing 6 per cent. interest, secured by a first mortgage on all the company's property will be offered at par to Arizona Commercial stockholders on the basis of 20 shares of Arizona Commercial stock having the right to subscribe for $100 of the bonds, and each such subscribing stockholder shall receive one share of Superior & Boston stock, $5 paid, for each two shares which such a stockholder holds of Arizona Commercial. A special meeting of Superior & Boston shareholders has been called for Sept. 30, to be held in this city. Superior & Boston directors propose levying an assessment so that the company shall be free from debt. The plan for consolidation will leave over $600,000 in the treasury of the merger which will permit development work to be done on both the Arizona Commercial and Superior & Boston properties, including the McGaw, Limestone, and Gardner mines of the Superior & Boston and the Eureka, and Copper Hill mines of the Arizona Commercial, thus placing the consolidated companies in a position to produce a larger tonnage of ore at an earlier date and at a greater profit than would be possible were either of the companies to operate alone.

Cobalt

Sept. 8—The resignation of D. Lorne McGibbon from the presidency of La Rose Consolidated and from the directorate of the Nipissing, has occasioned considerable surprise, especially as no reason has been assigned for the change. When Mr. McGibbon took charge of La Rose affairs, the dividend rate was cut from 16 per cent. to 8 per cent. per annum. Since that time the company has been piling up large cash and ore reserves, and is now in a better position than at any previous time in its history. Mr. McGibbon has consistently opposed any increase in the dividend rate, while some of the other directors have favored it, and this may possibly account for his retirement from the company.

Mine operators and residents in the Gowganda district are making an appeal for financial aid to keep up the wagon road between Elk Lake and the former town. Assistance in this matter has been refused by the government, notwithstanding the deplorable condition of the road and the consequent high cost of transportation. The Gowganda district is now producing more silver than at any time since it was first discovered, and owing to the distance from the railway, and poor transportation, operating costs are high. The road was originally built by the Government, but like many such pieces of work the money was not always expended to the best advantage, and the road was never finished in good shape. Owing to the fact that the district is an unorganized territory in the Forest Reserve, it is impossible to legally levy a tax for such improvements.

Porcupine

Sept. 8—The Cripple Creek section of the Porcupine district has lately been coming in for a good deal of attention, due partly to the fact that several important options have been taken on properties. On account of the difficulties of transportation, Cripple Creek has heretofore not been accorded the consideration it deserves. An interesting feature of the section is the fact that on many of the properties the veins are found in the granite formation. The veins in this rock are usually narrow, but high in gold content, most of which is in the pyrites. It is probable that during the coming winter, at least two properties will be equipped with plants.

The work of rebuilding the burned towns of Porcupine is proceeding rapidly, and a general spirit of optimism prevails throughout the district.

Judging from present appearances the long-anticipated Porcupine boom is likely to dissolve into thin air. This is not caused by any lack of faith in the mines, but appears to be the result of general widespread conditions, helped out by the fire. The collapse of the boom will not be an unmixed evil, although it will affect adversely some of the smaller companies, as it will establish the camp more quickly on a legitimate mining basis, and will undoubtedly cause a drop in the prices at which claims are now held. These prices are, in the majority of cases, out of all proportion to the prospective value of the properties and serve to keep out the better class of operators.

Considerable comment has lately been heard regarding Bewick, Moreing & Co., and their two Porcupine flotations, the Northern Ontario Exploration Company, and the Ontario Porcupine Goldfields Development Company. The offerings of these two promotions were made simultaneously in England and Canada, and while but little stock was disposed of in the former country, the Canadian subscription was large. Notwithstanding the fact that the majority of the stock is held in this country, the Canadian shareholders have absolutely no representation on the board of directors, and they are much dissatisfied with conditions as they are at present. The properties themselves possess considerable merit as prospects.

Sudbury

Sept. 7—The report that strong interests have taken bonds on the Saville and Gosland groups in the new gold district northeast of Sudbury and about 40 miles north of Gowganda, and the inspiration of the many free gold specimens which prospectors are bringing out from the section, which is near West Shining Tree lake, has started a "rush," which is accelerated by the approach of winter. Upward of 50 applications for claims in the district are being filed daily with the recorder at Sudbury and the daily train is crowded. One firm of surveyers has been engaged to survey over 100 claims.

The discoveries are in the new townships of Asquith and Churchill. The section is tributary by canoe route from the Canadian Northern branch, running north from Sudbury. The formation is reported as schist with "quartz dikes," similar to that in the Porcupine district.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

The Mammoth, Lulu, Mt. King, and Mt. King fraction, between the Chugatch and William Gentzler properties, have been sold to an eastern syndicate by Dailey, Drake & Company.

In the Nizina district, a group of 24 claims on Cañon creek, near Spirit mountain, has been purchased by Philadelphia men who will exploit the nickel-copper ore that occurs in wide veins.

Alaska Consolidated—At a depth of 500 ft. a wide vein of high-grade bornite has been drifted upon for a length of 200 feet.

California-Nevada Copper Company—The tunnel on the old Ebner mine is now 750 ft. long. This tunnel will be 2800 ft. long when completed. The site for the stamp mill has been graded.

Enterprise—Heid & Bach, Juneau, owners of this property on Limestone inlet, are considering the installation of a 10-stamp mill.

Big Thing—A rich strike is reported in the 1300-ft. tunnel of this mine at Carcross. The mine has been shipping ore for some time.

McClintock—A new placer strike has been made on this creek. The gold is said to be coarse and the ground soft. Prospectors are rushing in.

Kennicott—Development work is to be started on this low-grade copper deposit adjoining the Bonanza.

Bonanza—Machinery is being placed in the concentrator building which is now practically completed. The machinery for the power plant is *en route;* the concrete foundations have been laid.

Jumbo—At this mine on Gold Creek the vein has been drifted upon for 57 ft. showing pay ore.

Arizona

Cochise County

Western Mines and Development Company—This company has acquired the Towner-Lovell group of 32 claims in the Whetstone mountains. A large mill is to be built at once.

Mohave County

Oro Plata—The mill machinery is now on the site; the work of erection under the direction of W. W. Elliot will be started at once. Water is being pumped from the mine; as soon as the 180-ft. level is accessible, work will be started to open a new vein recently found lying parallel with the two previously known veins. Water will not be pumped from below the 180 level until the mill is put in commission; the water will be used in the mill.

Brighter Days—Ore has been followed from the surface to a depth of 100 ft. It is said that a drift will be driven into the Lucky Boy workings, where ore of milling grade can be taken from the old stopes. The company may build a mill when the reserves warrant, or may ship all the ore to Needles. F. H. Stull, Chloride, is in charge.

Ruth—The No. 1 shaft is still in ore. At the mill a satisfactory recovery of gold is reported on the electro-plates. A higher grade ore is now being milled.

Prosperity—It is reported that a wide vein of ore has been cut in the tunnel of this mine of the Golconda group, in Todd basin. The tunnel is now 1000 ft. long and has been driven for some time past through zinc ore, but the new strike is much richer than any ore heretofore encountered.

Pinal County

Douglas Copper Company—This company has just been incorporated to work on 14 claims that adjoin the Ray Consolidated property.

Santa Cruz County

Red Cone—At this mine, in the Patagonia mountains, the lower tunnel is being driven through mineralized ground, and it is expected that the vein will be reached within 30 days. It is stated the money has been raised to build a smeltery.

Yavapai County

United Verde—At the smeltery operations have been resumed. During August some of the furnaces were out of blast, while repairs were being made to foundations and machinery that had become disarranged from subsidence of ground.

California

Amador County

Bunker Hill—The regular monthly dividend of $10,000 was paid Aug. 15. Most of the ore treated continues to come from the 1950-ft. level.

Argonaut—During the installation of electrical power machinery the hoist was operated by water power. The extraction of ore in the upper levels continues while the lower levels are being bailed.

Calaveras County

Lightner—The judgment of the Superior court which awarded to James V. Coleman the 77 ft. of ground in dispute between the Lightner and the Angels has been nullified by the recent decision of the U. S. Land Office, vesting the title of the ground in the old Lightner company. Coleman also was awarded money damages for extraction of ore from this ground. It is reported that Coleman may carry the matter to the Secretary of the Interior.

Eldorado County

All the mines except two in the Placerville district were recently temporarily closed on account of a break at Camp 7 in the ditch of the Western States Light and Power Company. The Pacific and the Excelsior, having auxiliary power plants and reservoir, continued in operation.

Patterson—This old mine, the Snow and the Horseshoe, near Newtown, have been combined and are now under the financial control of W. K. Jenkins, of San José. Development work will be started on the Patterson, formerly a producer.

Humboldt County

Horse Mountain Copper—This company is preparing to build a concentrating mill, and proposes shipping the concentrates to the smeltery at Coleman, Wash. A wagon road connecting the mine with the county highway is under construction. David Wilson, Eureka, manager.

Inyo County

Santa Rosa—This property, which was discovered this year, and has shipped 220 tons of lead-silver ore to Keeler, has been sold to D. Holland, of Tonopah, and J. Gunn, of Independence. The mine is about 26 miles by wagon road from Keeler.

Skidoo—The output of this mine for July is reported at $18,000, the largest run in the life of the mine. The cyanide plant is being enlarged and improved.

Kern County

Orphan Girl—A run of 300 tons of ore from this mine was made at Barney Osdick's Tiptop mill. The owners of the mine may build a cyanide plant.

Mariposa County

Oro Rico—Development work at this mine, near Coulterville, has warranted the building of a 20-stamp mill, which will be put in commission in October. A concentrator and cyanide plant are also contemplated. Electricity is employed for

light and power. Oro Rico Mining Company, owner; T. H. Mutton, Coulterville, superintendent.

SIERRA COUNTY

Omega—Electric power is being installed at this mine near Forest. Steam has been employed during the development period. William A. Hussey, Oakland, manager.

Alaska—The 20-stamp mill at this mine at Pike will be enlarged to 40 stamps. Increased milling capacity will enable the owners to work the low-grade ores. An electric hoist is also contemplated. George St. John, manager.

TRINITY COUNTY

Headlight—It is reported that a dredge will be built to operate on Trinity river. The 10-stamp mill will be increased to 20 stamps. David Goodale, superintendent.

Union Hill—This hydraulic mine and others adjoining and nearby are being investigated by a syndicate in which the owners of the Headlight mine are said to be interested. The properties were optioned by W. A. Boland last winter.

Colorado

CLEAR CREEK COUNTY

It is said that in the Georgetown district the situation is better than it has been for four years with the shipments increasing. Several parties of lessees on the Smuggler are mining good ore. Two classes of concentrates being made, lead and zinc.

Dorit—In this mine on Chicago creek, near Idaho Springs, a vein of rich gold and silver ore has been struck in a lateral from the Peterson tunnel. The claim is said to be a western extension of the Little Mattie which has produced upward of $2,000,000.

GILPIN COUNTY

Federal—This mine near Central City, Russell Gulch district, has shipped, since July 1, 79 tons of smelting ore to Golden. R. Hughes, superintendent.

Topeka—A streak of high-grade gold ore in a shoot 300 ft. long, is just reported as having been cut at the 1400-ft. level of this mine in Russell gulch.

LAKE COUNTY—LEADVILLE

As a keynote of the prosperity of the district it is stated with authority that the Arkansas Valley smeltery is at present receiving more ore daily than it has in many months past, and in value the ore is above the average.

Chrysolite—Shipments of zinc-carbonate ore from the comparatively shallow shaft are being maintained.

Mt. Champion—This company is about ready to start the mill. Last month 1500 tons of ore were taken from the property and stacked awaiting the completion of the mill.

Vindicator—F. L. Sigel says that a crosscut 120 ft. long will be driven in each direction from the heading of the Roosevelt tunnel in order to open any water courses, but when the work will be started will be determined at the next meeting of the directors.

Specimen—Lessees Johnson & Argall have shipped three cars of ore, mined at the 400-ft. level. They are following the stringers that led into the big stope on the 400-ft. level which was mined out three years ago by the Western Investment Company.

Mound City—A large compressor has been received and will be installed at once. After the air compressor is installed the property will be equipped with machinery with which mining can be done at greater depth than the present bottom of the shaft.

SAN JUAN REGION

The concentration mill at the Vermilion mine, Animas Forks, built by R. W. Hollis, manager, is reported to have made a successful first season's run, with a recovery of 81 per cent., which it is expected will be raised to 85 per cent. by the addition of settling tanks. It is treating 70 tons per day, concentrating 5.5 tons into one. The full capacity of the mill is 100 tons.

Cumberland—A vein of ore containing gray copper, rhodonite and gold has been discovered.

Bright Diamond—Governor John F. Shafroth visited Ouray to inspect this mine, one of the group of claims owned by the Wanakah Mines Company.

Buffalo Boy—The new winze, being sunk on the vein, is between 60 and 70 ft. deep, in good ore all the way.

TELLER COUNTY—CRIPPLE CREEK

Western Investment Company—This company, leasing on the Victor, Empire State and Ophir, shipped 50 cars of ore in August.

Ajax—The August output from this mine on Battle mountain was 40 cars.

Forest Queen—This mine shipped 19 cars in August.

Isabella—This property on Bull hill is credited with an August output of 25 cars of ore.

Portland—A rescue station is being installed. The employees will be trained in the use of the rescue apparatus. Other companies, it is said, will provide similar stations.

Stratton Estate—The August shipment from the American Eagle by the Colorado Mines and Investment Company is reported to have been 10 cars of ore which contained $11,000 in gold, and netted about $8,000.

Jerry Johnson—The lessees on this Ironclad hill mine sent out 31 cars in August.

Idaho

Hercules—A flume, 36x20 in., from Lake gulch, is being constructed to carry wash water to the new mill. The flume will be 3½ miles long. The present water supply is inadequate during the dry season.

Nonpareil—The officers of the company announce that work will be resumed at an early date. Four claims are owned and they are situated about 1000 ft. from the Carbonate Hill mine at Mullan.

Federal—The Cleveland group of claims recently bonded by this company, lies west of the Standard-Mammoth group, the Cleveland vein being a continuation of the Standard vein. The Federal company has worked its Standard-Mammoth property up to the Cleveland mine, and orebodies have been discovered extending into the Cleveland property. The new mine will probably be worked from the Standard shaft.

United Lead—Ten men are now employed on two shifts at this property which is situated near Osborne. A lower tunnel is being driven which will give an additional depth of 700 ft. The present breast of the tunnel is 550 ft. from the vein.

Kansas

Harmon—The company, which has leased the Prudential tract at Galena has succeeded in lowering the water to the 100-ft. level. The mill is being rebuilt.

North Empire Tailing Company—The 250-ton pile of zinc ore has been sold to the Edgar Zinc Company. The pile has been held for about two years and is reported to have brought a flat price of $45.

Michigan

COPPER

South Lake—Development machinery for immediate installation has been ordered, and will be suitable to a depth of 1000 ft. Shaft work has been somewhat retarded by a heavy inflow of water, and a larger pump is being installed.

Contact—Exploratory operations with one diamond drill are being continued in the horizon of the Lake lode. No. 7 hole is now being drilled.

New Baltic—Promising copper ground has been disclosed in the shaft and the drift at the 360-ft. level.

Ojibway—The lower levels from No. 1 shaft have opened up some good copper ground and it is expected that a mill run will be made before Jan. 1.

IRON

Lake—The Cleveland-Cliffs company, operator, is extending the area of stocking ground to the east of the shaft. The new space when completed will have a capacity of 200,000 tons.

Lake Angeline—It is expected that the stock piles will be cleaned up before the present season closes.

Breitung—The shipments from these mines at Negaunee have been heavier than most other groups on the Marquette range. The last ore in stock was shipped recently, and regular shipments of about 75 cars per day are being maintained.

Minnesota

Iron

Kennedy—At this Cuyuna range mine, 300 men are employed and it is stated that this force will probably be retained through the winter. This property is supplying all the ore shipped from the Cuyuna range this season.

Hill—About 450 cars per day are being sent out from this mine operated by the Oliver company on the Mesabi range. The stripping is nearly completed.

Virginia—The stripping of this Pickands, Mather & Co.'s mine, north of Eveleth, on the Mesabi range, has been completed after two years' work. Shipments are being made, but the movement is well under capacity.

Missouri

Hackett—The company has resumed work and is unwatering the mill ground on the 180-ft. level. A deposit is being worked at the 137-ft. level. The mine is in the west Joplin sheet-ground district.

Hayseed—The mill near Carthage was dynamited and the boiler and engine badly damaged. No motive can be assigned for the deed.

Wright Tailing Mill Company—S. Van Dorser, of Holland, has bought the E. T. Wright tailing mill and 15 tailing piles from the United Zinc Company. The tailings will amount to about 250,000 tons.

Montana

Butte District

Butte & Ballaklava—Ore shipments have commenced again after about a year's shutdown, due to the litigation with the Anaconda company, and an average of one car of ore per day is being shipped to the East Butte smeltery. The shaft, which was damaged by water during the time of the High Ore fire, has been retimbered from the 1200-ft. level to the 1400-ft. level, and it is upon the latter level that the ore, which is now being shipped, is being mined. This vein was not included in the litigation. The drift has been driven 45 ft. and has opened up 5 ft. of ore, containing copper glance and bornite in bunches, and averaging about 5 per cent. copper and some silver. On the 1200-ft. level a drift has disclosed 18 in. of bornite and copper glance on the foot wall, averaging 30 per cent. copper and 25 oz. of silver per ton. It is the intention to mix this high-grade ore with the lower grade being taken out on the 1400-ft. level. This will bring the average up to 8 or 9 per cent.

Broadwater County

Black Friday—It has been reported that a deal is under way for the sale of the Black Friday mine in the Radersburg district to New York and Butte capitalists for $250,000. The mine, which is owned by Anson Bennett, of Toston, Willard Bennett, of Helena, and Attorney General A. J. Galen, has been in operation for over three years, and recently on the 600-ft. level, high-grade ore was discovered.

Jefferson County

Norma—This recently organized company in the Clancy district is getting its property in condition for mining. The shaft on the Norma claim, which has a depth of 300 ft., has been completely retimbered by the new company, and a new surface plant has been installed, including a hoist, air compressor and boilers. The vein has been mined to a depth of 200 ft., the ore running about $40 per ton in silver, galena and blende, with pyrites carrying a little gold. It contains about 85 per cent. silica, and for this reason the Washoe smeltery has charged only about $3 per ton for treatment. Eight distinct veins have been traced on the property, and a crosscut is now being driven from the bottom of the shaft to intersect the nearest vein.

Nevada

Comstock Lode

Mexican—The ore production for the month of August, as reported by the superintendent's weekly letters, was $94,000, the highest single week's output being for the week ended Aug. 19, when the gross assay value of the ore extracted was $34,417. The highest average car sample for the month was $113 per ton. With the ore-shipment returns for August all in, the company reported a cash balance of $39,000; the expenses will probably be under $20,000.

Ophir—The ore stoped from the 2100 and 2200 levels in August had a gross assay value of $62,000, the production for the last two weeks of the month averaging $15,000. Complete returns on a run of 2000 tons of ore, ended Aug. 19, show the net yield to be $63,704.

Crown Point—Ore extracted from the 1400-level stope during August was valued at $16,000.

Union Consolidated—The north prospecting drift on the 2400 level was advanced over 100 ft. in August. The three-compartment winze, now 40 ft. below the 2500 level, is entering a highly mineralized country.

C. & C.—Reopening the old drift on the 2500 level to the joint Ophir and Mexican winze, used in the early days, has shown from soundings that the shaft is open and free to the 2900 level. New pumps have been ordered to be placed at the head of this winze to be used in unwatering to the 3000 level.

Elko County

The results of development work at Jarbidge are reported to be gratifying. The Bourne 40-ton mill has produced its first bar of bullion and the Pavlak is to start crushing within a few days. The Pavlak mill has a capacity of 150 tons and will treat custom ore as well as ore from the company's mine.

Esmeralda County

Florence—The shaft is now 860 ft. deep. Sinking will be discontinued until the shaft has been alined where swelling ground was encountered, and the station on the 800 level has been cut. About 170 tons of ore per day are now being milled.

Goldfield Consolidated—It is estimated that during August 30,580 tons of ore were crushed for a yield of $850,000 at a cost of $220,000. The net profits for the month will amount to about $630,000.

Goldfield-Granite Mountain—The new hoist at this Gold Mountain property is in operation. The shaft, now 65 ft. deep, will be sunk to 150 ft. where a new level will be opened. The main tunnel is now 1200 ft. long.

Eureka County

Farmers' Mining Company—At this mine, five miles from Eureka, the 10-stamp mill and cyanide plant are being operated. The mine is well developed with ore in sight to supply the mill for several years.

Lyon County

Nevada Douglas Copper Company—The gypsum deposits at Yerington, owned by this company, are to be worked. The gypsum will be shipped to Reno. At first 100 tons per day will be shipped, which amount will be increased to 300 tons within 18 months.

Mason Valley—The Pacific Live Stock Company has withdrawn the suit recently commenced to enjoin the Mason Valley Mines Company from operating its smeltery, now being constructed.

Nye County

A deposit of potash in Railroad valley, about 75 miles northeast of Goldfield, is to be tested by boring with a Keystone drill. The deposit, in an old lake bed, is about three miles square, and at the surface, assays 6 per cent. potassium.

Tonopah-Belmont—About 50 men are at work excavating for the new mill; this force will be doubled as soon as the new compressor and air drills are ready. The machinery for the mill has arrived.

White Pine County

Giroux—The cause of the recent fire has not been determined and possibly never will be. A rescue party entered the mine by the Alpha shaft, but failed to find the two missing men. The Alpha and Giroux shafts have been sealed and water and brine are being poured in. The actual damage will be slight.

New Mexico

Grant County

Miser's Chest—This group of claims, near Lordsburg, has been surveyed for patent by County Surveyor C. E. Johnson.

Ricolite—The Ricolite company, of Portland, Ore., recently purchased this property at Redrock. Work will start at once.

Lone Mountain—Eight men, under the direction of York & Sutton, are developing a claim in the vicinity of this mountain.

Socorro County

American Zinc—The Linchburg tunnel, operated under option by this company, has been closed down.

Tri-Bullion—A contract has been let for sinking the shaft to the 300-ft. level. A new boiler, hoist and a larger pump have been installed.

Germany—The property has been temporarily closed, pending the installation of a new electric hoist.

Juanita—About five cars per month of good carbonate of zinc ore are being mined and shipped.

Graphic—Sulphide ore is being broken in sufficient quantity to operate the mill. Development work is being done.

Oregon

North Pole—Albert Geiser, of Baker, has taken a lease and option on this mine in the Cracker Creek district, near Bourne. The mine, owned by the Eastern Oregon Mining Company, has been one of the largest gold producers of the State for a number of years, with a total output of about 160,000 tons of ore, containing approximately $2,500,000 in gold. It is planned to develop immediately the large area of virgin ground on the north end of the property, as well as the deeper levels at the south end.

Utah

Beaver County

Sheep Rock—Robinson brothers have installed a new table at their five-stamp mill at Beaver, and are operating successfully. They are treating $30 ore from the Sheep Rock and turning out concentrates reported to run $920 per ton. This can be shipped profitably in spite of the long wagon haul to Milford. The mill is treating six or seven tons per day.

Lady Bryan—A car of ore has been mined from the new strike on the 300-ft. level, where 5 ft. of ore are exposed. This ore runs well in copper with some gold and silver. Shipments of lead ore are also being made.

Indian Queen—A trial shipment of silver-lead ore has been made by leasers. The ore is said to average about $25 per ton, and to be holding out well.

Blackbird Gold and Copper—During the spring and summer, a boarding house, office, shaft house, etc., were built. The shaft has been sunk to the 300 level and sinking to the 500 level will be continued. The company has a 60-h.p. gasolene hoist, designed by John Steele, superintendent of the mine, which runs the compressor and hoist at the same time. Twelve men are employed.

Busy Bee—Drifting is being done from the bottom of the 200-ft. shaft. Iron pyrite, carrying $1.50 in gold, has been encountered.

Juab County

Gold Chain—New buildings have been erected and new machinery installed. A sidetrack has been laid by the railroad, which does away with the wagon haul and lessens operating expenses. Work will be resumed shortly.

Opohongo—This company, which paid its first dividend a few months ago, will profit by the Gold Chain's improvements, as its operations are carried on through that company's workings. Connections with the orebody, at present being exploited, will be made through the Gold chain, and the ore hoisted through the latter's shaft.

Scranton—The new orebody opened recently on the 300-ft. level has been followed for 40 ft. and averages from 3 to 6 ft. in width; an incline has been sunk on it 30 ft. below the 300 level, with ore still going down. This ore was struck in the Belmont section of the property, and is different in character from that being mined in other parts of the mine. About four cars of ore per week, or 800 tons per month, are being shipped.

Selma—The Telluride Power Company is furnishing electric power for the machine drills at this property in North Tintic. An electric hoist will be installed, and a shaft sunk.

Lehi-Tintic—The main tunnel, which is following a fissure, is in 700 ft., giving the workings a depth of about 350 ft. It will take another 150 ft. of work to get under the outcrop.

Mammoth—From four to six cars per week are being marketed, and present work is adding to the ore reserves. A raise has been driven, connecting the 700- with the 800-ft. level, where ore in new territory was discovered.

Salt Lake County

Columbus Extension—Suit to quiet title to some Alta ground has been filed by the West Toledo against this company.

West Toledo—Samples recently taken on this property near the Columbus Consolidated showed 45 per cent. lead, 80 oz. silver and $5 in gold. There are eight claims and the principal workings consist of a shaft 110 ft. deep. It is figured that by driving a tunnel east of Superior gulch, some of the main fissures could be cut within 1200 ft., though the objective point, the old Toledo fissure, is some distance further.

South Hecla—At a recent meeting of stockholders, the action of the directors was ratified in agreeing to transfer the property into the merger being formed by J. P. Edwards and Norman W. Haire, of Michigan. These two men now have control of the City Rocks, South Hecla and Grizzly properties.

Summit County

Park City shipments for the week ended Sept. 2 amounted to 6,313,410 pounds.

New York Bonanza—A shipment of 70 tons of ore, which has been accumulating for some time, has been made. Drifting to the southwest is being done on the 900 level, and some ore is being mined from the 300.

Ontario—Forty cars of ore, or about 2000 tons, have been shipped by leasers during the last few months. The old workings have been cleaned out from the 100- to the 300-ft. level, so that ore can be sent out through the tunnel instead of being dropped to the 600 and hoisted.

Washington

Belcher—The company, operating in Ferry county, has delivered 12,000 tons of iron sulphide ore to the Granby smeltery at Grand Forks, B. C., and is now filling a large contract with the British Columbia Copper Company.

Granby—Extensive prospecting with diamond drills is being done by this company in Okanagon county.

North Washington Power and Reduction Company—Construction of the new mill in the Republic district is progressing slowly, but when completed is expected to aid greatly in improving conditions in the camp. There are reported to be considerable quantities of from $5 to $10 ore available, and it is believed that fine grinding and cyaniding will render them profitable. A 50-ton mill is at present in operation.

Canada

Manitoba

Canada Cement—The company has begun the construction of a large cement manufacturing plant at Winnipeg, for the supply of the Western market. At first the raw product will be shipped from the eastern mills to be finished in Winnipeg, but ultimately a burning department will be added and the whole process carried on there.

Ontario

Grasselli Chemical Company—This company, of Cleveland, Ohio, has decided to establish a Canadian branch, and has purchased 160 acres at Hamilton, upon which it will erect a plant at a cost of about $500,000. The company manufactures sulphuric, muriatic and acetic acids.

ONTARIO—COBALT

The shipments from Cobalt for the week ended Sept. 1 were: McKinley-Darragh, 243,915; La Rose, 207,650; Coniagas, 168,690; Hudson Bay, 124,350; Chambers-Ferland, 64,000; Nipissing, 63,400; Beaver, 62,200; Kerr Lake, 61,504; Buffalo, 60,750; Cobalt Lake, 60,300; Provincial, 50,280; total, 1,167,039 lb. Bullion shipments, Nipissing, 121,709 ounces.

Trethewey—A 3-in. vein of high-grade ore has been opened upon this property.

Temiskaming—A shoot of high-grade ore has been opened up on the 575-ft. level.

Beaver—The main shaft on this property is to be continued another 100 ft. to the 500-ft. level. Shipments for August were the heaviest since the company was formed.

Silver Cliff—The property has been closed down.

Nipissing—This company shipped 89 bars of silver bullion, valued at $49,705, which is the second largest shipment from any single mine in the district.

Crown Reserve—Vein No. 14 has been encountered on the 150-ft. level in the Keewatin formation. At this depth it is 3 in. wide and is stated to carry 5000 oz. of silver to the ton. This vein yielded rich ore on the upper level.

Badger—An 8-in. vein of calcite and cobalt has been struck in drifting on the 80-ft. level.

O'Brien—This mine has shipped 16,553 oz. of silver bullion to London.

ONTARIO—PORCUPINE

Homestead—Underground operations are to be started on this Swastika property. Fifteen men are employed in constructing camp buildings.

Dome Extension—This company is putting in an eight-drill compressor.

Rea—Recent developments on the lower level of this property are giving good results.

Scottish Ontario—A new surface discovery has been made on the property.

Davidson—This property, in Whitney township, has been purchased by Toronto men.

McIntyre—The plant on this property has been started and 10 drills are now being used in underground development.

Hughes—The Montreal owners of this property have capitalized it at $2,500,000.

Porcupine Gold—Resampling of the No. 3 vein gives 15 ft. of ore, averaging $11.70 per ton, and 10 ft. of mineralized schist on the north wall assaying $5.20 per ton.

Porcupine Southern—This company has recently been incorporated with a capitalization of 1,000,000 shares, par $1, and controls 16 claims in Whitney and Tisdale townships.

Apex—The directors' report to the general meeting shows receipts from sale of stock, etc., $56,701, expenditures, $13,461, and balance in bank $43,240. A plant comprising a compressor and two 50-h.p. boilers has been ordered.

Reciprocity Mines, Ltd.—This company has been organized, with Clark Timmerman, of New York, as president, is capitalized at $1,000,000, and has taken over the McKenzie Veteran claim of 160 acres north of the Rea.

Swastika Central—This company, which owns 18 claims, has ordered a shot drill to be placed on the Green claim on Pike lake, adjoining the Swastika mine. This is the first shot drill to be operated in the camp.

Crown Chartered—The directors have decided to push development on the Davidson claim, recently acquired by the company. The shaft, which is now down 25 ft. on the main vein, will be put down to 100 ft., where a crosscut will be driven to determine the width of the vein.

Sutherland—These two locations, in Bristol township, have been sold to a Duluth, Minn., syndicate. A quartz vein 30 ft. wide has been traced on both locations. Work will be pushed as rapidly as possible before cold weather sets in.

Jupiter—Two shafts are down 100 ft. and crosscutting has begun. A compressor plant has been ordered.

YUKON

Yukon Gold Company—The 1911 season promises to be the most profitable since the company began operations in 1908. To date the production is $1,853,900, or $422,000 more than for the corresponding season of last year. Two dredges are to be added to the seven now being operated, and it is thought that they will be completed in time to contribute to this season's production. In 1908 the profits were $500,000; in 1909, $750,000; in 1910, $1,450,00, and for this year a further increase is expected.

Mexico

BAJA CALIFORNIA

San Juanes Reduction—This company, a Denver corporation, has a 30-ton leaching plant, and is operating mines nearby, treating the ore for the gold it contains. The second run has just terminated after important alterations and additions to the plant, deemed necessary from the results obtained in the first run. J. C. Puttner is manager.

La Trinidad Mines Company—This company is developing several properties in the San Antonio district. Several hundreds of tons of ore have been mined and one parcel of 40 tons has been shipped for treatment. There are 150 tons of high-grade ore ready to be milled after the rains set in, and a quantity of lower grade ore that will be held until a mill is built. This is a Chicago company.

CHIHUAHUA

The production of the Parral mines for the week ended Sept. 2, amounted to nearly 13,000 tons, of which about 8000 tons were treated at local mills. This is a considerable increase over the preceding weeks and quite as great as before the revolution.

San Toy—An extra dividend of 2 per cent. has been declared by this company. This is the third distribution to stockholders within a year, and the mines at Santa Eulalia are reported in condition to warrant uninterrupted dividend payment for several years. Donald B. Gillies is manager.

Rio Tinto—Shipments of sulphide ores are being received from Santa Eulalia and it is probable that the smeltery will be put in operation shortly.

Cusi-Mexicana—This lately organized company is operating on a large scale in the Cusihuiriachic camp under the management of B. L. Farrar and superintendency of B. F. Sturtevant.

HIDALGO

Santa Gertrudis—Two more tube mills will be ordered for the new mill. The present monthly production is worth about $500,000.

SONORA

Pacific Smelting and Mining Company—This smeltery at Guaymas will be blown-in some time in October.

La Cobriza Copper Company—This company owns property 14 miles from Noria; three 100-h.p. boilers, a double-drum hoist and twelve-drill compressor will be added to the equipment of the mine, in which about 3000 ft. of development work has been done. The smeltery will be blown-in within a few weeks.

Sonora Pacific Mining Company—This company, formerly known as the Llano Copper Company, owns claims 10 miles northeast of Llano. Work will be resumed in the near future after a period of idleness caused by dissention in the old company. About 100,000 tons of copper-silver-gold ore is said to be developed.

Boston-Cananea—Shaft sinking is to be resumed at this property.

Asia

CHOSEN

Oriental—The clean up for August, according to cable report was $122,800.

South America

CHILE

Braden Copper—The Fortuna No. 4 tunnel, 393 ft. below No. 3½, was driven 86 ft. during August and the face is now near the Fortuna orebody. The average of all ore through which the tunnel has been driven is 2.17 per cent. copper. The first unit of the hydroëlectric plant is now in commission, so it is expected that the concentrator will begin treating ore this month.

The Markets

Coal Trade Review

New York, Sept. 13—Coal-trade conditions generally are little changed. Reports from different centers are inclined to be contradictory. On the whole it appears that the steam-coal trade throughout the West is still rather slow, and consumers are not inclined to stock up ahead to any extent. On the other hand domestic coal is moving well for the season, almost everywhere.

Lake trade is active, and there is less delay in handling cargoes.

The seaboard bituminous trade is improving slightly. The West Virginia roads have so many cars in the Lake trade that there are some complaints of a shortage of cars for tidewater movement.

Anthracite trade has been good. The heavy August shipments reported below seem to have been absorbed without difficulty.

Coal Traffic Notes

Anthracite shipments by Lake from Buffalo for the season to Sept. 1 were 2,482,340 tons; an increase of 110,870 tons over last year.

Coal shipments originating on lines of Southern railway, half year ended June 30: Tennessee district, 591,508; Alabama district, 1,258,721; total, 1,850,229 short tons, a decrease of 250,705 tons from last year.

Coal and coke tonnage of Baltimore & Ohio railroad, seven months ended July 31, short tons:

	1910	1911	Changes
Anthracite	556,206	608,400	I. 52,194
Bituminous	17,545,696	15,950,651	D. 1,595,045
Coke	2,814,476	2,145,118	D. 669,358
Total	20,916,478	18,704,269	D. 2,212,209

The total decrease shown this year was 10.6 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top railroad, eight months ended Sept. 1, were 441,900 tons in 1910, and 312,145 in 1911; decrease, 129,755 tons.

Anthracite shipments in August were 5,531,796 tons, being 727,731 tons more than in July, and 535,752 tons more than in August, 1910. For the eight months ended Aug. 31 the shipments were, in long tons:

	1910	1911	Changes
Reading	7,869,543	8,408,620	I. 539,077
Lehigh Valley	7,418,876	8,282,488	I. 863,612
N. J. Central	5,477,069	5,897,453	I. 420,384
Lackawanna	6,355,422	6,456,485	I. 101,063
Del. & Hudson	4,208,930	4,792,597	I. 583,667
Pennsylvania	3,911,052	4,184,061	I. 273,009
Erie	4,943,323	5,912,397	I. 969,074
N. Y., Ont. & West.	1,828,636	1,711,343	D. 117,293
Total	42,012,851	45,645,444	I. 3,632,593

Total increase, 8.6 per cent. The New York, Ontario & Western was the only line showing a decrease this year.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

New York

Anthracite

Sept. 13—Trade in prepared sizes continues steady. The steam sizes seem to be in rather better demand. The movement of coal to Buffalo for shipment by Lake is heavy. August shipments show a good increase. The talk of large quantities of coal going into storage lacks the essential element of truth.

Schedule quotations for domestic sizes for September are $4.75 for lump, $5 for egg and stove and $5.25 for chestnut; all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.20@2.70; No. 2 buckwheat or rice, $1.75@2.15; barley, $1.40@1.70; all according to quality, f.o.b. New York harbor.

Bituminous

Trade shows some improvement this week. Harbor trade has made quite a spurt, and more orders are coming from New England in the coastwise trade. All-rail trade is reported good.

Prices are about the same, perhaps a little firmer. A good steam coal can be had for $2.50@2.60, f.o.b. New York harbor; lower grades sell down to $2.35 and better up to $2.90. Gas coals are $1.15@1.20 for ¾-in., and $1.05@1.10 for run-of-mine, at mines. Slack is still uncertain.

The West Virginia roads are still short of cars, and coal is rather scarce for immediate shipment at Hampton Roads.

Coastwise trade is steady. Rates are about the same as last quoted, but the tendency is strong.

Birmingham

Sept. 11—The coal trade in Alabama is showing a little improvement. The railroads are furnishing all the cars needed. Miners and mine workers are in demand at some coal mines in this State but the general rule is that there is no complaint to be made of the labor situation. A considerable amount of coal is being shipped to New Orleans.

The coke market is a little more active, the make in Alabama showing better figures this month.

Chicago

Sept. 11—Sales of coal are in general good as compared with the record of the last few weeks, but there is complaint from dealers that the usual autumn buying is slow in setting in, and the revival of trade expected for September has not yet made its appearance. That the Illinois and Indiana mines are producing largely in excess of needs—or can easily produce on short notice—is known to the average consumer. He will not increase his buying to any great extent while this condition exists. Sales for autumn steam needs are increasing, though slowly; the retailers and larger consumers of domestic coals are holding off until the last moment for the laying in of their supplies.

Illinois and Indiana bring, in car-lots, $1.85@2.35 for lump, $1.75@1.85 for run-of-mine and $1.25@1.45 for screenings. These prices apply, of course, on the greater number of sales; there is a light range above and below them. Eastern coals in general are in good condition. Smokeless West Virginia continues scarce as to lump and plentiful as to run-of-mine, the former selling at $4.05@4.25 and the latter at $2.95@3.05. Hocking is somewhat weak, being in large supply for the demand, and sells for $3.15, list price, or slightly less. Anthracite sales are very light as a consequence of the coming of the full September prices.

Cleveland

Sept. 11—Steam-coal trade is improving a little, a gradual increase of sales being reported. The Lake trade is more active, as the upper docks are being gradually cleared and there is less delay in unloading. Cars are reported short on several roads, and demurrage is being enforced. Reports indicate that Ohio mines will average about 70 per cent. of capacity at present.

Prices for Middle district coal, f.o.b. Cleveland, are quoted at $2.15 for 1¼-in., $1.90 for ¾-in. and $1.80 for run-of-mine. Slack is in oversupply and prices are variable.

Indianapolis

Sept. 11—There have been some perceptible advances made in the coal-mining business. The improvement is largely due to the increasing orders for Lake shipments to northwestern points. The operators say that the shipments of Indiana coal during August show a considerable gain over July; but even then the shipments are short of the corresponding month in 1910. The causes for the continued depression in the coal-mining business are a fruitful subject for discussion among mine operators. Some claim it is not difficult to explain, because

there is a corresponding decline in other lines of business. They are still sanguine that conditions will clear up and that with the approach of winter the shipments will become normal.

Pittsburg

Sept. 12—There is no change in the situation, local demand being only moderate, while the Lake movement has been hampered by stocks at upper lake docks, but these are moving at a better rate and shipments are expected to be heavier from now to the end of the season. Production is at between 50 and 75 per cent. of capacity, with prices moderately well held. We continue to quote: Nut, $1.10@1.15; mine-run, $1.15; ¾-in., $1.25; 1¼-in., $1.35; slack, 60@75c. per ton at mine, slack occasionally being sold at 10 or 15c. below the minimum quoted.

Connellsville Coke—No important sales of furnace coke have been made since those reported a week ago, but the market continues firm and coke could hardly be bought as cheaply as a fortnight ago. It has become generally recognized that on account of labor conditions it would be difficult to increase production much more, there being plenty of coke-oven labor, but few men available for underground work. Foundry-coke contracts have practically all been made. We continue to quote: Prompt furnace, $1.50@1.55; contracts over last three months, $1.70@1.75; prompt foundry, $1.85@2; contract foundry, $2@2.25 at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Sept. 2 at 347,284 tons, a gain of 15,000 tons; shipments at 4074 cars to Pittsburg, 4726 cars to points west and 837 cars to points east, a total of 9637 cars.

St. Louis

Sept. 11—The coal market since the first of the month has been a little disappointing. The general advance seems to have checked buying to a certain extent. The seeming large demand was evidently made more by the speculation of jobbers than by actual requirements of the trade.

All of the mines in the high-grade district are still behind with their orders and it seems very nearly sure that they will be able to obtain the advanced prices before they are forced to solicit additional business. The price of Standard coal shows an upward tendency on the domestic sizes and a better movement. A number of mines which have been down all summer are starting up and the tonnage is larger than at any time this year, which naturally has a tendency to keep prices down.

The tonnage report for the first seven days of September shows receipts of 134,493 tons or 3214 cars from Illinois mines.

Current prices on the St. Louis market are as follows:

	At Mine.	St. Louis
Standard Coal:		
6-in. lump	$1.10	$1.62
2-in. lump	0.95	1.47
Mine-run	0.75	1.27
2-in. nut	0.85	1.37
2-in. screenings	0.35	0.87
Mt. Olive & Staunton:		
6-in. lump	1.40	1.92
2-in. lump	1.25	1.77
2-in. nut	1.00	1.52
2-in. screenings	0.60	1.12
Trenton:		
6-in. lump or egg	1.90	2.42
3x2-in. nut	1.50	2.02
Carterville:		
6-in. lump or egg	1.50	2.17
3x2-in. nut	1.30	1.97
2-in. screenings	0.50	1.17
Mine-run	1.00	1.67
Franklin County:		
6-in. lump or egg	1.60	2.27
3x2-in. nut	1.40	2.07
2-in. screenings	0.50	1.17
Anthracite:		
Grate	....	6.70
Egg or stove	....	6.95
Chestnut	....	7.20
West Virginia Smokeless:		
Lump or egg	2.00	4.50
Mine-run	1.10	3.60
Byproduct Coke:		
Egg and stove	....	4.75
Chestnut	....	4.65

Prices on Illinois soft coal at East St. Louis, Granite City, Venice or Madison, Ill., are $0.20 per ton less than St. Louis prices.

Anthracite—The market is quite brisk and a very good tonnage of all sizes is moving. The buying was a little light during July and August and it is thought that an unusually good tonnage will move this Fall.

FOREIGN·COAL·TRADE

British Coal Trade—Exports of coal from Great Britain, with coal sent abroad for use of steamships in foreign trade, seven months ended July 31, long tons:

	1910	1911	Changes
Coal	35,281,787	36,373,517	I. 1,091,730
Coke	478,918	545,210	I. 66,292
Briquets	910,994	981,094	I. 70,100
Total exports	36,671,699	37,899,821	I. 1,228,122
Steamer coal	11,016,691	11,090,042	I. 73,351
Total	47,688,390	48,989,863	I. 1,301,473

Imports were only 21,921 tons in 1910 and 12,551 tons this year.

Indian Coal Production—The total mined in British India for the full year was 11,870,064 long tons in 1909, and 10,548,094 in 1910; a decrease of 1,321,970 tons. In 1910 Bengal furnished 88 per cent. of the total. The coal exported last year was 1,391,248 tons; coal consumed by the railroads, 3,771,247 tons.

Welsh Coal Prices—Messrs. Hull. Blyth & Co., London and Cardiff, report prices of coal for export on Sept. 1 as follows: Best Welsh steam, $4.50; seconds, $4.14; thirds, $3.84; dry coals, $3.96; best Monmouthshire, $3.78; seconds, $3.60; best Cardiff steam smalls, $2.40; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Sept. 13—The iron and steel markets continue to show a very considerable volume of new business. They do not recover from the tendency to buy in comparatively small quantities for early delivery. Buyers seem to hesitate about making long commitments, even when their business is good. There is no inclination to speculate on the future course of the market. The general belief seems to be that the still unemployed capacity of mills is a practical guarantee against advancing prices.

Business in finished materials is active in several lines, notably in structural steel and plates. Bars and other smaller material are also in fair demand. Sheets are selling also in a fairly large way. In most lines prices continue to be irregular, and shading of the nominal prices is general. The controlled market is not in existence at present, and its restoration soon does not seem possible.

In pig iron business is rather quiet, though there are more inquiries coming in. Prices are irregular, notwithstanding the attempts of sellers to hold them. The buyers hold too strong a position to permit any advances by the merchant furnaces. Southern iron is again being pressed in seaboard territory, forming an additional element of weakness in prices.

The Steel Corporation reports the unfilled orders on its books on Aug. 31 at 3,695,985 tons; an increase over July 31 of 101,900 tons, and the heaviest amount reported since July 31, 1910. The increase over Dec. 31, 1910, is 1,021,228 tons.

It is reported that the steel ingot production of the Steel Corporation in August exceeded that of July by 214,000 tons.

A shipment of 7500 tons of Alabama pig iron was made last week to Swansea, Wales, through the port of Savannah.

Pig Iron Production—The reports of the blast furnaces, as collected and published by the *Iron Age*, show that on Sept. 1 there were 203 coke and anthracite furnaces in blast, having a total daily capacity of 62,900 tons; an increase of 3700 tons over Aug. 1. Making allowance for the charcoal furnaces, the total production of pig iron in the United States in August was 1,953,400 tons; for the eight months ended Aug. 31 it was 15,439,000 tons.

Baltimore

Sept. 17—Exports for the week included 280,860 lb. scrap tin to Rotterdam; 222,334 lb. bridge material to Costa Rica; 1600 tons steel rails and 81 tons angle-plates to St. John, Newfoundland; 2017 tons steel rails and 257 tons rail-fastenings to Havana. The imports included 500 tons spiegeleisen, 900 tons ferromanganese and 30 tons silicospiegel from

Middleboro, England; 5720 tons manganese ore from Bombay, India; 30,450 tons iron ore from Cuba.

Birmingham

Sept. 11—Southern pig-iron manufacturers are receiving inquiries for iron for delivery during the coming year, but so far there has been no general selling. The quotations on iron for delivery during the last quarter of the year are still around $10.50 for No. 2 foundry with reports of concessions being made from that price. Makers are not anxious to sell at $10.50 price for delivery during the coming year and $11 is considered low enough. The consumers are not willing to take a chance at that price and consequently trading has not opened up yet. Sales at present are a little slow. There is considerable iron yet in the yards.

The home consumption shows a little improvement. The cast-iron pipe makers are producing a large quantity of pipe and are making steady shipments. A peculiar accident happened the past week when a train-load of cast-iron pipe shipped out of the Birmingham district to San Diego, Cal., went through a trestle less than 40 miles from the city and the pipe was practically reduced to scrap. The shipment is being duplicated as quickly as it can be loaded.

Chicago

Sept. 11—The market for pig iron shows no decided change, though in general it may be considered somewhat firmer than a week ago. Pig-iron melters are still reluctant to contract far ahead for their needs; they occasionally run over the 1000 ton mark, but in general consider themselves wise in confining their purchases to 300 to 600 tons. Inquiries continue large, showing that the users are watching the market for signs of a change and are figuring on first-half tonnage very generally. Some sales are being made for the first half but more for the last quarter and first quarter.

Southern iron holds to $10 Birmingham, or $14.35 Chicago, as a minimum, and is in good demand compared with Northern iron, which brings $14.50 for No. 2, on last-quarter sales in each case. Sales of iron and steel products are still large and are greatest in the structural material lines, with railroad materials still in good demand. General business is increasing notably with the coming of September, and the feeling is hopeful in every line connected with iron and steel.

Cleveland

Sept. 11—August shipments of Lake iron ore were 326,938 tons more than in July. The vessel situation is about the same, and it looks as if there would be some laying up of boats in September.

Pig Iron—Some sales of basic and foundry are reported. There is more inquiry, and the United Steel is in the market for 3500 tons of basic pig, this year's delivery. Quotations, Cleveland delivery, are $15.90 for bessemer; $13.50 for basic; $13.75@14 for No. 2 foundry; $14.35 for No. 2 Southern.

Finished Material—Sheets and plates are in some demand, but shading of prices continues. Bars are quiet. Structural steel is quite active.

Philadelphia

Sept. 13—No further weakness has developed in pig iron and business continues to be of a hand-to-mouth character. It is the impression that no decided improvement or change will take place until consumers begin to feel interested in taking care of next year's requirements. As to this there is no disposition shown. Stocks at furnaces are slowly receding. Some inquiries for No. 2 X foundry aggregating 3000 tons are on the market today. Southern irons have ceased to cause makers here any concern. No. 2 X foundry is $14.75@15.25, with some Virginia grades offered at $14.50 here.

Billets—Open-hearth steel in the East is still quoted at $23.40 delivered. It is probable that this figure will be shaded.

Bars—Bars continue dull and no disposition is shown to buy beyond urgent necessities.

Sheets—Sheets are selling more freely but in a retail way. The shading reported in the West has not extended to this market.

Pipes and Tubes—A good deal of tube stock has been received here and other points in the East, which fills contracts placed some months ago. There is no life in merchant pipe.

Plates—A large amount of new business in plates is now in sight, growing out of the awarding of contracts for some 16 vessels for Government and private service. The shipyards are figuring on large orders. Tank and marine plate is now under inquiry, mostly for small lots.

Structural Material—The structural mills have gathered in quite a bunch of orders and quotations, particularly on fabricated material. Prices have hardened slightly.

Scrap—Sales of scrap for the week have been confined to railroad, which sold a little below recent prices, and No. 1 yard scrap, which has been pretty well cleaned up.

Pittsburg

Sept. 12—The finished-steel trade has lost a little more ground in the past week. It has been traveling on the down grade, although very slowly, for three or four weeks, losing a little tone in the matter of prices now and then, with bookings slightly decreasing, particularly the strictly new buying, specifications against contracts continuing fairly good. The bright feature is the insistence of buyers upon prompt delivery, once the material is bought and specified. It is evident that stocks are at the lowest possible ebb, in the hands both of jobbers and of manufacturing consumers. The material being shipped is going into actual consumption, and shipments are heavier than they were in June or July.

The most disheartening feature in the market is the lack of snap when it comes to prices. At one point or another weaknesses are almost constantly being developed. The latest is that 1.20c. can be done easily in steel bars, with 1.15c. possible on attractive business and reports that 1.15c. can be shaded. Sheets are subject to additional shading, there being well authenticated rumors of cases in which a basis of less than 1.90c. on 28-gage black has been done. Tinplates, however, are firm, but mill operations are decreasing slightly.

The strongest item in the list is structural material, and this because the structural shops are quite well filled with business for several months to come. The American Bridge Company is understood to be filled up solidly for four months, with considerable work to extend over a longer period. Structural shapes are being held quite firmly on the 1.35c. basis.

Pig Iron—Bessemer and basic have been quiet. The United Steel Company, Canton, O., has taken 3500 tons of basic, 500 tons for September and 1000 each for the next three months, the iron being understood to have commanded $13.50, delivered, which is equal to $13 at the nearest furnace, an equivalent of $12.60 at Valley furnaces, which do not seem to have been able to meet the competition. In foundry iron there is a constant run of small orders and as the market is firmly established there is little general inquiry, consumers merely buying from time to time from their usual sources of supply. Sales are reported of 750 tons of forge at $13, Valley, and 250 tons of commercial malleable at $13.25, the silicon being lower than in standard malleable. We continue to quote: Bessemer, $15; basic, $13; No. 2 foundry, $13.50; forge, $13; malleable, $13.25@13.50, all at Valley furnaces, 90c. higher delivered Pittsburg, except that foundry iron can be had at slight concessions from the parity, for Pittsburg delivery, by certain detached furnaces conceding all or part of their freight advantage.

Ferromanganese—The Youngstown Sheet and Tube Company is understood to have bought 4000 tons of ferromanganese for forward delivery, at a concession from regular asking prices, which are $37, Baltimore, for first half of next year and $38 for second half, with odd lots for early delivery going at $36.50@36.75, Baltimore.

Steel—For some time past it has been possible to buy sheet bars at a material concession from the open quotation, and

billets at a slight concession. The gap has widened lately, and reports are current of concessions amounting to $2 or more on sheet bars; but sales are light as consumers are well covered by regular contracts. We quote regular asking prices, which have become purely nominal, at $21 for billets and $22 for sheet bars, f.o.b. maker's mill, Pittsburg or Youngstown. Rods are $27, Pittsburg, but are not moving.

Sheets—Tonnage has not improved, and some mills appear to be making larger concessions than formerly, exceeding $2 a ton from the nominal bases of 2c. on black and 3c. on galvanized sheets. We quote as the regular market 1.90@1.95c. on black sheets, 28 gage, 2.90@2.95c. on galvanized, 28 gage, 1.45c. on blue annealed, 10 gage, $1.35 per square on painted corrugated roofing and $2.50 per square on galvanized corrugated roofing.

St. Louis

Sept. 11—The pig-iron market remains fair. Buyers continue to buy in small quantities but often, so it takes quite a number of orders to make up any considerable tonnage under present conditions. Buying is confined to last-quarter and first-quarter delivery. There seems no inclination on the part of buyers to speculate. Prices are $10.25@10.50 per ton, Birmingham, or $14@14.25, St. Louis, for No. 2 foundry, the higher figure prevailing on shipments for next season's delivery.

Iron Ore Trade

Shipments of iron ore from the Lake Superior region for the season to Sept. 1 are reported by the Cleveland *Iron Trade Review* as below, in long tons:

Port	1910	1911	Changes
Escanaba	3,162,271	2,418.251	D. 744,020
Marquette	2,249,774	1,200,748	D. 1,049,026
Ashland	2,878,971	1,509,841	D. 1,367,130
Superior	5,227,687	6,382,273	I. 1,154,586
Duluth	9,823,644	4,370,117	D. 5,453,527
Two Harbors	5,484,682	3,724,838	D. 1,759,844
Total	28,827,029	19,606,068	D. 9,220,961

The August shipments were 5,548,311 tons, being 326,938 tons more than in July, and the heaviest shipments of any month this season.

It is reported that a new concern organized in New York and known as the Brazilian Iron and Steel Company, has taken options on iron-ore deposits at Marianna and Santa Barbara, Minas Geraes, Brazil. Also that an American syndicate has bought the Alegria mine in the same province.

British Ore Imports—Imports of iron ore into Great Britain, six months ended June 30, were 3,768,880 long tons in 1910, and 3,513,214 in 1911; decrease, 255,666 tons.

Imports of manganese ore for the six months were 274,210 long tons in 1910, and 181,550 in 1911; decrease, 92,660 tons.

METAL MARKETS

New York, Sept. 13—The metal markets generally are still rather quiet, though a fair volume of business is reported.

MONTHLY INDEX NUMBERS

Month	1910	1911	Month	1910	1911
January	127	110	July	112	112
February	124	115	August	113	117
March	118	112	September	114	.....
April	118	114	October	111	.....
May	113	118	November	117	.....
June	107	115	December	115	.....

Year 1909, 115; 1910, 115.
Numbers for each month and year calculated on approximate sales of pig iron, copper, tin, lead, zinc and aluminum.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
July 1911	$2,178,088	$ 2,594,653	Imp.$ 416,565
" 1910	828,451	10,282,649	Imp. 9,354,198
Year 1911	15,429,650	36,367,679	Imp. 20,938,029
" 1910	50,345,182	29,671,180	Exp. 20,674,002
Silver:			
July 1911	5,275,008	3,920,794	Exp. 1,354,214
" 1910	5,124,471	3,794,888	Exp. 1,329,583
Year 1911	39,718,211	25,881,395	Exp. 13,836,816
" 1910	32,178,689	25,696,408	Exp. 6,482,281

Exports from the port of New York, week ended Sept. 9: Gold, $55,100, chiefly to Panama; silver, $989,704, principally to London. Imports: Gold, $512,210, largely from Mexico; silver, $30,270, from South America.

Gold—Prices on the open market in London were unchanged at 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coins. Most of the gold arriving went to the Bank of England.

Platinum—The market remains rather quiet, but the advanced prices are firmly held. Dealers ask $45 per oz. for refined platinum and $47.50 per oz. for hard metal. The foreign markets are reported strong, with some expectations of an advance.

Our Russian correspondent writes, under date of Aug. 31, that there is a further advance in prices. Demand is strong, and the production does not increase. In St. Petersburg there is a disposition to hold back from sales at current prices. At Ekaterinburg crude metal, 83 per cent. platinum, brings 9.85 rubles per zolotnik—equal to $37.04 per oz. At St. Petersburg the same grade is quoted at 37,800@37,900 rubles per pood—$37.09 per oz. average.

Iridium—The price remains unchanged at $62 per oz. for pure metal.

SILVER AND STERLING EXCHANGE

Sept.	7	8	9	11	12	13
New York	52¼	52¼	52⅜	52¼	52⅛	52¼
London	24⅛	24⅛	24 3/16	24⅛	24⅛	24⅛
Sterling Ex.	4.8600	4.8600	4.8605	4.8600	4.8605	4 8615

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Silver—The tenor of the market continues to be steady, and the price moves within the same narrow limits. Later monsoon reports from India are good, and prospects are brighter. Silver closes steady and quiet at 24⅛d. in London.

Exports of silver from London to the East, from Jan. 1 to Aug. 31, reported by Messrs. Pixley & Abell:

	1910	1911	Changes
India	£4,197,500	£5,292,700	I. £1,095,200
China	1,113,500	949,700	D. 163,800
Total	£5,311,000	£6,242,400	I. £931,400

India Council bills in London brought an average of 16.03d. per rupee for the week.

Copper, Tin, Lead and Zinc

NEW YORK

Sept.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
7	12½@12⅝	12.25@12.30	41½	4.50	4.35@4.37½	5.85@5.90	5.70@5.75
8	12½@12⅝	12.25@12.30	41⅜	4.50	4.35@4.37½	5.85@5.90	5.70@5.75
9	12½@12⅝	12.25@12.30	41	4.50	4.35@4.37½	5.85@5.90	5.70@5.75
11	12½@12⅝	12.25@12.30	40¾	4.47½@4.50	4.32½@4.37½	5.85@5.90	5.70@5.75
12	12½@12⅝	12.25@12.30	40	4.47½@4.50	4.32½@4.37½	5.85@5.90	5.70@5.75
13	12½@12⅝	12.25@12.30	39¼	4.47½@4.50	4.32½@4.37½	5.85@5.90	5.70@5.75

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Sept.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
7	56	56 1/16	59¾	187¾	185¾	14 7/16	27¾
8	55¾	56 1/16	59⅛	185¾	183¾	14 7/16	27¾
9	.....	.....	.....	.....	.....	.....	.....
11	55 1/16	56⅜	59⅛	184¾	182	14 7/16	27¾
12	55 1/16	55⅞	59¼	182⅝	180⅛	14 7/16	27¾
13	55⅜	56 1/16	59¼	180	177¾	14⅛	27¾

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.40c. ± £1 = ± 0.21¾c.

Copper—Although a close analysis of the Producers' Association figures would not warrant such an effect, their influence upon the market, particularly in Europe, has been unfavorable, as the public at large appears to have expected a bigger reduction in the stocks than actually took

place. The unsettled condition in the European financial centers also contributed toward giving the copper market a somewhat weaker tone, which, however, so far is only slightly reflected in the quotations for refined copper, Lake copper closing at 12½ to 12⅝c., and electrolytic copper at 12.25 to 12.30c. Casting copper is quoted nominally at 12 to 12¼ cents.

On the other hand, the standard market had a relatively sharp break, and after breaking through £56 for the three months' option on Sept. 12, the close is somewhat higher, due to bear covering, at £55 7s. 6d. for spot, and £56 1s. 3d. for three months.

Copper sheets are 18@19c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 13¾c. base, carload lots at mill.

Exports of copper from New York for the week were 5050 long tons. Our special correspondent gives the exports from Baltimore for the week at 1306 tons.

Tin—No plausible reason was given for the continued decline in the London market. The disturbed political conditions abroad may have influenced the rather more liberal sales that were made, especially of future tin. Support on part of the Syndicate was evidently lacking, and, therefore, prices gave way easily. At the close, the market is cabled as weak at £180 for spot, and £177 15s. for three months.

With the lower prices cabled from abroad, the premium on spot and near-by tin, which had again become quite formidable, dwindled rapidly and gave consumers a chance to secure some of their supplies on a more liberal basis. This was taken advantage of, and a fair business is reported. September tin at the close is quoted at about 39¼ cents.

Messrs. Robertson & Bense report the arrivals of tin ore at Hamburg, Germany, in August, at 1003 tons, all from Bolivia.

Arrivals of Bolivian tin at Liverpool in August included 2824 tons concentrates and 88 tons bars; the total equivalent to 1782 tons metallic tin.

The next Banka auction sale will be held at Rotterdam, Sept. 27. The offerings will be 72,000 slabs, equal to 2500 long tons of tin.

Lead—The offerings of Missouri lead have been on an increasing scale, and prices have eased off to 4.32½@4.37½c. at St. Louis, the close at New York being 4.47½@4.50 cents.

The foreign market is exceptionally firm, due to a shortage of near-by supplies, and quotations are strong and advancing at £14 10s. for Spanish lead, and £14 12s. 6d. for English.

Spelter—While there are reports current of sales of small lots of spelter for immediate shipment at fancy prices, the deliveries for which smelters are in a position to supply the metal freely are rather neglected. The close is steady and unchanged at 5.85@5.90c., New York, and 5.70@5.75c., St. Louis.

The new smeltery at Collinsville, Okla., was put in operation at the beginning of September.

The foreign market appears to have recovered its equilibrium, and closes steady at £27 15s. for good ordinaries, and £28 for specials.

Zinc dust is quoted at 7½c. per lb., New York.

Base price of zinc sheets is $8 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Imports and Exports of Metals

Exports and imports of metals in the United States, seven months ended July 31, are reported as follows, in the measures usual in the trade:

Metals	Exports	Imports	Excess
Copper, long tons	206,182	86,441	Exp. 119,741
Copper, 1910....	157,169	86,447	Exp. 70,722
Tin, long tons....	842	28,884	Imp. 28,042
Tin, 1910.....	396	27,583	Imp. 27,187
Lead, short tons.	61,503	53,623	Exp. 7,880
Lead, 1910.....	31,270	60,715	Imp. 29,445
Spelter, sh. tons.	3,565	1,227	Exp. 2,338
Spelter, 1910....	593	2,293	Imp. 1,700
Nickel, lb.....	14,233,495	16,589,322	Imp. 2,355,827
Nickel, 1910....	8,172,857	18,924,567	Imp 10,751,710
Antimony, lb.	160,844	6,489,053	Imp. 6,328,209
Antimony, 1910.	2,726	6,112,458	Imp. 6,109,732
Platinum, oz.....	47	60,983	Imp. 60,936
Platinum, 1910.	48	62,502	Imp. 62,454
Aluminum, value	$780,503	.....	Exp. $780,503
Aluminum, 1910	424,666	.....	Exp. 424,666
Ores, etc.			
Zinc oxide, lb. ..	16,519,115	.....	Exp. 16,519,115
Zinc oxide, '10..	15,227,495	.....	Exp. 15,227,495
Zinc dross, lb....	5,238,421	.....	Exp. 5,238,421
Zinc dross, '10..	6,162,714	.....	Exp. 6,162,714
Zinc ores, lg. tons	11,661	32,739	Imp. 21,078
Zinc ores, 1910.	12,506	37,484	Imp. 24,978
Chrome ore, tons	5	23,068	Imp. 23,063
Chrome ore, '10	30	23,432	Imp. 23 402

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Imports of aluminum are not given. The exports given above include reëxports of foreign material. Zinc contents of ores imported were 28,951,423 lb. in 1910, and 20,496,117 lb. in 1911. There were reëxported foreign ores containing 3,953,072 lb. zinc in 1910, and 13,126,026 lb. this year.

Other Metals

Aluminum—There is rather more business and sales are increasing. Competition for orders is very sharp, however, and quotations are a shade lower. No. 1 ingots can be had at 19½c. per lb. for large lots; smaller orders bring up to 20 or 20½c., according to the quantity and terms. French producers especially are pressing metal for sale. Active competition and low prices also prevail in the foreign market.

Antimony—There is nothing new in the market and business continues to be very much of a retail order. Quotations are now given at 8.25@8.37½c. for Cookson's; 7.75@8c. per lb. for Hallett's; 7.20@7.40c. for Hungarian, Chinese and other outside brands.

As noted briefly last week, the antimony syndicate has dissolved, after a short and not very successful career. It has had little influence on prices for some weeks past.

Quicksilver—Business is quieter than it has been. The New York quotation is off slightly, to $47 per flask of 75 lb. Spot supplies are not plentiful and jobbing prices are firmly held. San Francisco, $47 for domestic orders and $44.50 for export. The London price is £8 12s. 6d. per flask, with £8 10s. quoted from second hands.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 16—The high price of zinc sulphide ore was $47, and the base price $41@45 per ton of 60 per cent. content. Zinc silicate sold at $23@25 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $41.18. Lead ore sold as high as $61 per ton, and the average price, all grades of lead, was $58.86 per ton.

For six weeks the zinc shipment has been under 5000 tons per week, but this week exceeds that figure. While some purchasing agencies are buying very little zinc ore, others are more than making up the deficiency, and prices are very firm at the week-end, though there was an apparent sag at midweek. Buyers

SHIPMENTS, WEEK ENDED SEPT. 9

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,908,050	.....	900,070	$111,025
Joplin.....	1,970,370	.....	355,130	53,820
Alba-Neck....	780.110	.....	.....	17,942
Granby	56,830	1,135,800	50,830	17,860
Duenweg.....	556 480	147,570	59,970	15,649
Galena.....	477,210	.....	148 700	14,646
Oronogo.....	477,080	.....	72 950	11,943
Carl Junction	250,710	.....	.....	5,766
Jackson.....	136,180	.... .	63,950	4,882
Miami.....	62,000	.....	130,640	4,778
Aurora.....	129,620	.....	53.70 0	4,399
Spurgeon	64,100	146,780	24,300	4,261
Stott City.....	161,500	.....	.....	3,553
Cave Springs.	65,280	.....	.....	1,500
Lawton	61,240	.....	.....	1,408
Totals.....	9,156,760	1,430,150	1,860,240	$273,432
36 weeks..	345,086,750	24,528,760	61,560,770	$3,987,109
Blende val., the week, $198,697; 36 weeks, $6,845,737				
Calamine, the week, 19,388; 36 weeks, 392,798				
Lead value, the week, 55,347; 36 weeks, $1,748 574				

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1910	1911	1910	1911	1910	1911
January.....	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February....	40.69	40.21	39.47	39.16	53.64	54.46
March.....	43.60	39.85	39.71	38.45	51.26	54.57
April.....	41.00	38.88	39.33	37.47	49.72	56.37
May.....	40.19	38.25	37.51	36.79	48.16	55.21
June.....	40.20	40.50	37.83	38.18	48.80	56.49
July.....	39.63	40.75	36.80	38.96	48.59	58.81
August.....	40.13	42.50	37.32	41.28	49.75	60.74
September..	43.45	.....	39.96	.....	54.73	.....
October.....	43.31	.....	40.50	.....	53.18	.....
November...	47.20	.....	43.20	.....	54.80	.....
December...	42.50	.....	40.70	.....	55.70	.....
Year.....	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

who attempted to cut prices $1 on Thursday lost a large tonnage of ore.

Fall rains have been overcome in most of the camps, but water still causes a decided shortage in the output of Aurora and Galena. In the deeper mines the seepage is stronger now than at any previous time, and while it is gaining practically no headway the cost of drainage has been decidedly increased.

Platteville, Wis., Sept. 9—The highest price paid this week for zinc ore was $44.50; the base price, 60 per cent. zinc, was $44. The base price paid for 80 per cent. lead ore was $56@57 per ton.

SHIPMENTS, WEEK ENDED SEPT. 9

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	853,010	84,360	303,960
Mineral Point	600,300	.....	.....
Benton	335,870	.....	.....
Galena	327,000	.....	.....
Highland	167,000	.....	.....
Hazel Green	160.000	.....	.....
Harker	63,840	223,660	.....
Total	2,507,020	308,020	303,960
Year to date	105,168,649	6,016,695	21,774,010

Shipped during week to separating plants, 1,878,920 lb. zinc ore.

CHEMICALS

New York, Sept. 13—The general market does not show much activity, and the fall trade seems slow in getting under way.

Imports and Exports—Imports and exports of chemicals and raw material in the United States, seven months ended July 31:

	Imports	Exports	Excess
Copper sulph. lb.	.....	6,344,851	E. 6,344,851
Copper sul., '10	.....	3,439,717	E. 3,439,717
Bleach, lb.	50,907,542	17,368	I. 50,890,174
Bleach, 1910	53,204,538	496	I. 53,204,042
Potash salts, lb.	409,710,335	2,428,109	I. 407,282,226
Potash salts, '10	325,386,721	2,002,668	I. 323,384,053
Soda salts, lb.	17,024,885	338,909	I. 16,685,976
Soda salts, 1910	18,545,684	289,823	I. 18,255,861
Acetate lime, lb.	.....	46,964,099	E. 46,964,099
Acetate, 1910	.....	40,145,326	E. 40,145,326
Nit. of soda, tons	357,319	3,891	I. 353,428
Nitrate, 1910	327,331	4,206	I. 323,125
Phosphates, tons	.....	710,458	E. 710,458
Phosphates, '10	.....	571,164	E. 571,164
Sulphur, tons	12,027	16,297	E. 4,270
Sulphur, 1910	17,226	22,320	E. 5,094
Pyrites, tons	578,524	.....	I. 578,524
Pyrites, 1910	450,122	.....	I. 450,122
Magnesite, lb.	164,125,494	1,643,395	I. 162,482,099
Magnesite, 1910	156,525,136	2,703,822	I. 153,822,314
Sul. ammonia, lb.	96,213,359	.....	I. 96,213,359
Sul. am'nia, '10	81,848,314	746,862	I. 81,101,452
Arsenic, lb.	2,951,920	3,000	I. 2,951,620
Arsenic, 1910	4,119,309	2,912	I. 4,116,397

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites, the total imports of sulphur this year were 243,437 tons.

Copper Sulphate—Business has been on a fair scale. Prices are unchanged at $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Arsenic—The demand from makers of insecticides keeps up to an unusual degree for the season. Spot lots of white arsenic are still quoted at $2 per 100 lb., but supplies are scarce, and not much can be had for early shipment. For futures, $1.87½ per 100 lb. is quoted.

Nitrate of Soda—Business continues good and prices are firm at last quotations, 2.20c. per lb. for spot and 2.22½c. per lb. for futures.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on Sept. 1 as below; figures in long tons:

	1910	1911	Changes
Stocks, Jan. 1	14,000	12,790	D. 1,210
Imports, 8 mos	315,200	351,272	I. 36,072
Total supplies	329,200	364,062	I. 34,862
Deliveries, 8 mos	316,500	357,162	I. 40,662
Stocks, Sept. 1	12,700	6,900	D. 5,800
Afloat for U. S.	60,000	70,000	I. 10,000

Quantities afloat include all cargoes due to arrive at United States ports by Dec. 15 next.

MINING·STOCKS $

New York, Sept. 13—The general stock market has continued weak and irregular, with occasional small rallies, and only a moderate amount of trading. A few stocks have held their own, but most seemed to lack support and gave way. Changes were chiefly fractional and losses small.

On the Curb mining shares were also irregular and inclined to be rather weak. Cobalt shares showed several losses in quotation. Porcupine stocks were dealt in rather more freely than they have been. Copper stocks were in little demand demand and sold off fractionally.

At auction in New York, Sept. 7, a demand note for $25,000 of the Development Company of America, with $75,000 Saddle Mountain Mining Company first-mortgage bonds as collateral, brought $5000; demand note of same company for $6500, with $18,000 Saddle Mountain first-mortgage bonds and 530 shares Gila Copper Sulphide Company stock as collateral, $1300 for the lot.

The Texas Company has reduced its dividend from 2½ to 1¼ per cent. quarterly. This is John W. Gates' oil company.

Boston, Sept. 12—The copper-share market is more or less irregular, but the forced liquidation seems to have passed over. As a rule, prices are somewhat lower than a week ago, but this is only natural with the New York market in its present unsettled state. Even the Copper Producers' statement for August failed to arouse any interest in copper shares and the market remains in a lethargic condition.

The reduction in the Wolverine dividend resulted in a $6 decline to $97 on a few hundred shares. The present $9 per annum rate is the smallest since 1904 when $7.50 was paid. In 1907 the company distributed $17.50. Arizona Commercial fell to 25c. per share upon the announcement of a reorganization plan which practically wipes the stock out. In 1909 the stock sold as high as $51.75. The $1,000,000 convertible 6 per cent. bonds are selling at 45c. on the dollar, which is about what the company's smelter cost.

The present Arizona Commercial quotation is practically the price set on the right to subscribe to new bonds with a bonus of Superior & Boston shares thrown in.

COPPER PRODUCTION REPORTS

Copper contents of blister copper, in pounds

Company	June	July	August
Alaska shipments	1,773,300	.....	.....
Anaconda	21,850,000	21,900,000	22,500,000
Arizona, Ltd	2,700,000	2,750,000	2,720,000
Balaklala	.....	.....	.....
Copper Queen	7,088,862	6,373,062	7,006,197
Calumet & Ariz	3,656,000	4,394,000	4,650,000
Detroit	1,732,692	1,590,357	2,080,100
East Butte	841,200	.....	.....
Mammoth	.....	1,598,082	.....
Nevada Con	5,307,400	5,258,582	.....
Old Dominion	1,907,000	2,114,000	1,982,000
Shannon	1,098,000	1,150,000	1,442,560
South Utah	158,661	254,462	269,546
United Verde*	3,000.000	3,000,000	.....
Utah Copper Co	7,908,685	7,555,407	.....
Lake Superior*	19,800,000	17,060,000	19,000,000
Non-rep. mines*	12,851,700	16,800,000	.....
Total production	91,673,500	.....	.....
Imports, bars, etc.	22,348,964	20,999,078	.....
Total blister	114,022,464	.....	.....
Imp. in ore & matte	4,744,912	4,205,940	.....
Total	119,767,376	.....	.....
Brit. Col. Cos.:			
British Col. Copper	816 676	854,122	.....
Granby	858,733	1,228,846	.....
Mexican Cos.:			
Boleo	2,315,040	1,973,680	2,149,280
Cananea	3,462,000	3,994,000	.....
Moctezuma	2,071,960	2,340,404	2,263,707
Other Foreign:			
Cape Cop., S. Africa	.....	.....	.....
Spassky, Russia	542,080	672,000	.....
Exports from:			
Chile	3,960,000	7,168,000	4,032,000
Australia	7,168,000	7,056,000	7,392,000

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export
VIII, 1910	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424 316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599
V	126,962,544	64,543,963	61,978,557
VI	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,936,364	69,855,660

	VISIBLE STOCKS.		
	United States.	Europe.	Total.
IX, 1910	168,881,245	218,444,800	387,326,046
X	148,793,714	211,276,800	360,070,519
XI	139,261,914	198,060,800	337,322,711
XII	130,389,069	193,200,000	323,589,095
I, 1911	122,030,195	236,629,120	358,649,373
II	142,439,490	236,992,000	379,431,134
III	156,637,770	233,385,600	390,023,009
IV	162,007,934	223,014,400	385,022,434
V	165,555,908	212,284,800	377,840,708
VI	165,995,932	202,540,800	368,536,732
VII	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

Curb trading has been light with the cents stocks in the foreground. The feature of the trading here has been an advance in Porcupine Central from 79c. to $1.43¾ on prospective consolidation with other Porcupine properties.

Assessments

Company	Delinq	Sale	Amt
Argenta, Ida	Sept. 10	Oct. 10	$0.001
Best & Belcher, Nev	Sept. 4	Sept. 25	0.05
Black Horse, Ida	Sept. 18	Oct. 19	0.01
Calumet, Ida	Aug. 15	Sept. 15	0.001
Challenge, Nev	Aug. 17	Sept. 7	0.05
Columbus Ext., Utah	Sept. 4	Sept. 27	0.05
Con. Virginia, Nev.	Sept. 9	Sept. 13	0.25
Copper King, Ida	Aug. 15	Sept. 16	0.01
Douglas, Ltd., Ida	Aug. 25	Sept. 26	0.002
Exchequer, Nev	Sept. 19	Oct. 10	0.05
Hale & Norcross, Nev	Aug. 30	Sept. 20	0.05
Melcher, Ida	Aug. 26	Sept. 15	0.00½
New York-Bonanza, Utah	Sept. 8	.....	0.02
Overman, Nev	Sept. 12	Oct. 3	0.05
Pretoria, Ida	Aug. 15	Sept. 15	0.000½
Savage, Nev	Aug. 22	Sept. 12	0.10
Seven Troughs Mon., Utah	Aug. 12	Sept. 6	0.002½
Spider, Utah	Aug. 15	Sept. 15	0.002½
Springfield, Ida	Sept. 2	Oct. 2	0.000½
Tintic Standard, Utah	Sept. 9	Oct. 9	0.00
Torino, Ida	Aug. 15	Sept. 15	0.00
Utah Ideal, Utah	Sept. 6	Oct. 8	0.001½
Utah United Copper, Utah	June 24	.....	0.01½
Verde May, Ida	Sept. 6	Sept. 21	0.000½
Victoria, Mich	Aug. 21	.....	1.00
Western Monitor, Utah	Sept. 11	Oct. 12	0.002½

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870	53.308	24.343	24.797	24.583
June	52.538	53.462	53.043	24.166	24.651	24.486
July	51.043	54.150	52.630	23.519	25.034	24.286
August	51.125	52.912	52.171	23.588	24.428	24.082
September	51.440	53.295	.....	23.743	24.567	.....
October	50.923	55.490	.....	23.502	25.596	.....
November	50.703	55.635	.....	23.351	25.680	.....
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	12.019	13.091	12.275	57.238	54.035
May	12.550	11.989	12.885	12.214	56.313	54.313
June	12.404	12.385	12.798	12.611	55.310	56.368
July	12.215	12.463	12.570	12.720	54.194	56.670
August	12.490	12.405	12.715	12.634	55.733	56.264
September	12.379	.....	12.668	.....	55.207	.....
October	12.553	.....	12.788	.....	56.722	.....
November	12.742	.....	12.914	.....	57.634	.....
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1910.	1911.	Month	1910.	1911.
January	32.700	41.255	July	32.695	42.400
February	32.920	41.614	August	33.972	43.319
March	32.463	40.157	September	34.982	.....
April	32.976	42.185	October	36.190	.....
May	33.125	43.115	November	36.547	.....
June	32.769	44.606	December	38.199	.....
			Av. Year	34.123	.....

Prices are in cents per pound.

LEAD

Mohth	New York		St. Louis		London	
	1910.	1911.	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4.412	4.225	4.262	12.641	12.889
May	4.315	4.373	4.164	4.223	12.550	12.984
June	4.343	4.435	4.207	4.292	12.688	13.260
July	4.404	4.499	4.291	4.397	12.531	13.530
August	4.400	4.500	4.290	4.406	12.513	14.026
September	4.400	.....	4.289	.....	12.582	.....
October	4.400	.....	4.271	.....	13.091	.....
November	4.442	.....	4.314	.....	13.217	.....
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5.399	5.289	5.249	22.469	23.743
May	5.191	5.348	5.041	5.198	22.100	24.375
June	5.128	5.520	4.978	5.370	22.094	24.612
July	5.152	5.695	5.002	5.545	22.406	25.006
August	5.279	5.953	5.129	5.803	22.800	26.801
September	5.514	.....	5.364	.....	23.165	.....
October	5.628	.....	5.478	.....	23.900	.....
November	5.976	.....	5.826	.....	24.083	.....
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23.050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer		Basic		No. 2 Foundry	
	1910	1911	1910	1911	1910	1911
January	$19.90	$15.90	$17.96	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	15.90	16.84	14.65	16.75	15.00
May	17.10	15.90	15.94	14.30	16.18	14.72
June	16.52	15.90	15.60	14.06	15.53	14.56
July	16.40	15.90	15.40	14.03	15.40	14.53
August	16.09	15.90	14.89	14.00	15.16	14.47
September	15.92	.....	14.73	.....	14.93	.....
October	15.90	.....	14.65	.....	14.88	.....
November	15.84	.....	14.26	.....	14.78	.....
December	15.90	.....	14.15	.....	14.65	.....
Year	$17.10	.....	$15.65	.....	$15.83	.....

STOCK QUOTATIONS

COLO. SPRINGS Sept. 12

Name of Comp.	Bid.
Acacia	.02⅜
Cripple Cr'k Con.	.01½
C. K. & N.	.12
Doctor Jack Pot	.05½
Elkton Con	.60½
El Paso	.56
Findlay	.05½
Gold Dollar	.14½
Gold Sovereign	.02½
Isabella	.08
Jack Pot	.05½
Jennie Sample	.05
Lexington	‡.01
Moon Anchor	.01½
Old Gold	.03½
Mary McKinney	.42
Pharmacist	‡.01½
Portland	.90
Vindicator	.72⅞
Work	.01

SALT LAKE Sept. 9

Name of Comp.	Bid.
Beck Tunnel	.11
Black Jack	.07½
Carisa	‡.15
Cedar Talisman	.04
Colorado Mining	.33
Columbus Con	‡.28
Daly Judge	4.12½
Grand Central	0.91
Iron Blossom	‡1.02½
Little Bell	‡.40
Lower Mammoth	‡.01⅜
Mason Valley	7.00
May Day	‡.11½
Nevada Hills	2.87½
New York	.05⅜
Prince Con	‡.64
Silver King Coal'n	1.65
Sioux Con	.17
Uncle Sam	.46½
Yankee	.15⅞

TORONTO Sept. 12

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	6.00	Pearl Lake	.38
Hudson Bay	75.00	Porcu. Gold	.43
Temiskaming	.39	Porcu. Tisdale	.05½
Wettlaufer-Lor	.80	Preston E. D.	.24
Apex	.14	West Dome	1.04
Central	1.43	Standard	‡.03
Dobie	1.00	Foley O'Brien	.90
Dome Exten	.60	Rea	3.05
Hollinger	10.55	Coronation	.05
Imperial	.76	Swastika	.30

SAN FRANCISCO Sept. 12

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.03
Belcher	.62
Best & Belcher	.17
Caledonia	.38
Challenge Con	.16
Chollar	.12
Confidence	.60
Con. Virginia	.83
Crown Point	.83
Gould & Curry	.05
Hale & Norcross	.19
Mexican	3.50
Occidental	.50
Ophir	1.62½
Overman	.30
Potosi	.18
Savage	.22
Sierra Nevada	.39
Union Con	1.40
Yellow Jacket	.40

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	6.55
Jim Butler	.24
MacNamara	.18
Midway	.20
Mont.-Tonopah	.75
North Star	.17
West End Con	.59
Atlanta	.16
Booth	.08
C.O.D. Con	.08
Comb. Frac	.08
Jumbo Extension	.21
Oro	.05
Silver Pick	.06
St. Ives	.34
Tramps Con	.02
Argonaut	2.20
Bunker Hill	6.50
Cent. Eureka	1.00
So. Eureka	7.00

N. Y. EXCH. Sept. 12

Name of Comp.	Clg.
Amalgamated	57
Am. Agri. Chem.	53½
Am.Sm.&Ref.,com	68¾
Am. Sm.& Ref., pf.	104¾
Anaconda	33⅞
Batopilas Min	1¾
BethlehemSteelpf	61
Chino	18½
Comstock Tunnel	‡.20
Federal M.& S., pf.	48
Goldfield Con	5⅜
Great Nor., ore ctf.	45½
Homestake	82¼
Miami Copper	18⅜
Nat'nalLead,com.	49
National Lead, pf.	104
Nev. Consol	17¼
Pittsburg Coal, pf.	80⅛
Ray Con	14
RepublicI&S,com	24⅝
Republic I & S, pf.	90¼
SlossSheffi'd,com.	36
Sloss Sheffield, pf.	112
Tennessee Copper	‡33¼
Utah Copper	43
U. S. Steel, com.	68¾
U. S. Steel, pf.	114¾
Va. Car. Chem	52⅛

BOSTON EXCH. Sept. 12

Name of Comp.	Clg.
Adventure	4¾
Algomah	4
Allouez	21½
Am. Zinc	23
Arcadian	2¼
Arizona Com	49
Atlantic	‡6
Bonanza	50
Boston & Corbin	4¾
Butte & Balak	4¾
Calumet & Ariz	49½
Calumet & Hecla	410
Centennial	8½
Con. Mercur	.05
Copper Range	51
Daly-West	5
East Butte	10
Franklin	6¾
Granby	28
Hancock	18½
Hedley Gold	15
Helvetia	70
Indiana	6⅝
Isle Royale	12½
Keweenaw	2⅜
Lake	24
La Salle	4¼
Mass	5
Michigan	2
Mohawk	39
New Arcadian	2¼
North Butte	23¼
North Lake	4¼
Ojibway	4½
Old Dominion	37
Osceola	86
Parrot	9
Quincy	65½
Shannon	8⅛
Shattuck-Ariz.	16½
Superior	23¾
Superior & Bost.	2¼
Tamarack	22½
Trinity	3⅛
Tuolumne	4⅛
U. S. Smelting	32¾
U. S. Smelt'g, pf.	46
Utah Apex	2¼
Utah Con	11¾
Victoria	2
Winona	5
Wolverine	98
Wyandot	¾

N. Y. CURB Sept. 12

Name of Comp.	Clg.
Barnes King	‡.15
Braden Copper	4¾
B. C. Copper	3¾
Buffalo Mines	‡1¾
Butte & Vipond	.54
Butte Coalition	14½
Cobalt Central	.00½
Con. Ariz. Sm.	¾
Davis-Daly	⅞
Ely Con	⅜
Florence	1⅛
Giroux	4⅛
Greene Cananea	6
Greenwater	04⅛
Guanajuato	‡3¾
Guerrero	1¼
Guggen. Exp	180
Inspiration	6¾
Internat. S. & R.	‡124
Kerr Lake	3⅞
La Rose	4
McKinley-Dar-Sa.	1⅝
Min. Co. of A. new	5¼
Moneta Porc.	‡.12
Nev. Utah M. & S.	⅝
New Baltic	4⅝
Nipissing Mines	7⅞
Ohio Copper	1⅜
Pacific Sm. & M.	⅛
Precious Metals	‡1⅜
Ray Central	1⅞
Red Warrior	‡1⅛
South Utah M. & S.	⅝
Standard Oil (Old)	630
Stand'd Oil of N.J.	340
Stand'd Oil Subs.	325
Stewart	.76
Tonopah	6¼
Tonopah Ex	.95
Tri-Bullion	⅝
Tularosa	⅜
Union Mines	.25
Yukon Gold	3¾

LONDON Sept. 13

Name of Com.	Clg.
Camp Bird	£1 8 9d
Dolores	1 10 0
El Oro	1 3 3
Esperanza	1 13 9
Mexico Mines	6 17 6
Oroville	0 5 7½
Stratton'sInd.	0 2 0
Tomboy	0 17 6

BOSTON CURB Sept. 12

Name of Comp.	Last
Ahmeek	155
Bingham Mines	1½
Boston Ely	1
Boswyocolo	.10½
Cactus	.10
Calaveras	1
United Verde Ext.	.35
Chief Cons	.74
Corbin	1
Cortez	1⅛
Crown Reserve	2⅜
First Nat. Cop.	1
Live Oak	18½
Majestic	.31
Mazatan	1
Nat'l Mine & Ex.	.10
Nevada-Douglas.	2⅜
Oneco	1⅛
Raven Copper	.29
Rhode Island Coal	1⅝
San Antonio	3½
South Lake	4⅛
Trethewey	‡.65
United Zinc, pfd.	‡2
Vulture	5⅛
Yuma	‡.02

‡Last quotation.